[H.A.S.C. No. 111–49]

SPACE SYSTEMS ACQUISITION AND THE INDUSTRIAL BASE

HEARING

BEFORE THE

STRATEGIC FORCES SUBCOMMITTEE

OF THE

COMMITTEE ON ARMED SERVICES
HOUSE OF REPRESENTATIVES

ONE HUNDRED ELEVENTH CONGRESS

FIRST SESSION

HEARING HELD
APRIL 30, 2009

U.S. GOVERNMENT PRINTING OFFICE

51–763 WASHINGTON : 2010

For sale by the Superintendent of Documents, U.S. Government Printing Office
Internet: bookstore.gpo.gov Phone: toll free (866) 512–1800; DC area (202) 512–1800
Fax: (202) 512–2104 Mail: Stop IDCC, Washington, DC 20402–0001

STRATEGIC FORCES SUBCOMMITTEE

ELLEN O. TAUSCHER, California, *Chairman*

JOHN SPRATT, South Carolina
LORETTA SANCHEZ, California
ROBERT ANDREWS, New Jersey
JAMES R. LANGEVIN, Rhode Island
RICK LARSEN, Washington
MARTIN HEINRICH, New Mexico

MICHAEL TURNER, Ohio
HOWARD P. "BUCK" MCKEON, California
MAC THORNBERRY, Texas
TRENT FRANKS, Arizona
DOUG LAMBORN, Colorado

BOB DEGRASSE, *Professional Staff Member*
KARI BINGEN, *Professional Staff Member*
ZACH STEACY, *Staff Assistant*

CONTENTS

CHRONOLOGICAL LIST OF HEARINGS

2009

THURSDAY, APRIL 30, 2009

SPACE SYSTEMS ACQUISITION AND THE INDUSTRIAL BASE

STATEMENTS PRESENTED BY MEMBERS OF CONGRESS

WITNESSES

APPENDIX

SPACE SYSTEMS ACQUISITION AND THE INDUSTRIAL BASE

HOUSE OF REPRESENTATIVES,
COMMITTEE ON ARMED SERVICES,
STRATEGIC FORCES SUBCOMMITTEE,
Washington, DC, Thursday, April 30, 2009.

The subcommittee met, pursuant to call, at 1:01 p.m., in room 2212, Rayburn House Office Building, Hon. Ellen O. Tauscher (chairman of the subcommittee) presiding.

OPENING STATEMENT OF HON. ELLEN O. TAUSCHER, A REPRESENTATIVE FROM CALIFORNIA, CHAIRMAN, STRATEGIC FORCES SUBCOMMITTEE

Ms. TAUSCHER. Good afternoon. The hearing of the Strategic Forces Subcommittee will come to order.

I want to thank you all for attending. This is an important hearing that will delve into issues surrounding the acquisition of national security space systems.

During the past decade, most national security space programs have experienced significant cost increases and schedule delays. Our goal today is to explore why this happens and to figure out how to deliver satellite systems in a timely and cost-effective manner.

Specifically, the witnesses have been asked to address the following questions: Why can't we control costs, and deliver space systems in a timely fashion? Are plans for national security space acquisitions properly balanced with the industry's capacity to deliver? Finally, what can Congress and the executive branch do to address these issues?

We have three excellent witnesses today. First, we have Mr. Josh Hartman, who is Director of the Space and Intelligence Capabilities Office, and a Senior Advisor to the Under Secretary of Defense for Acquisition, Technology and Logistics (USD (AT&L)). Mr. Hartman is well-known to members of the committee. He is a former staffer here on the House Armed Services Committee (HASC) and on the House Appropriations Committee (HAC). Mr. Hartman began his career as an Air Force Officer, where his assignments included working on space programs in both the Air Force and the National Reconnaissance Office (NRO).

Ms. Cristina T. Chaplain, the Director of Acquisition and Sourcing Management at the U.S. Government Accountability Office (GAO), will also testify. Ms. Chaplain is responsible for GAO assessments of military and civilian space acquisition. She has led a variety of Department of Defense (DOD)-wide contracting-related and best practices evaluations during her 18-year career at GAO.

Finally, my friend, Marion C. Blakey, President and Chief Executive Officer (CEO) of the Aerospace Industries Association (AIA), will testify. Prior to joining AIA, Ms. Blakey served a five-year term as Administrator of the Federal Aviation Administration (FAA). Before that, she served as the Chairman of the National Transportation Safety Board (NTSB).

I want to thank each of our distinguished witnesses.

I also want to recognize Mr. Steve Miller, the Director of the Operations Analysis Procurement Planning Division for the Cost Analysis Improvement Group, which we call the CAIG, in the Office of the Secretary of Defense (OSD). He is with us today to answer any questions about the cost analysis report that Congress ordered the Secretary to complete.

Last May, this subcommittee drafted language in the Defense Authorization Act directing the Secretary of Defense to task his Cost Analysis Improvement Group to analyze the industrial base that supports the development and production of space systems and provide a report by October 1, 2008. This report, which has been provided to each subcommittee member's office, will form the basis for our discussions this afternoon.

The report drew three conclusions. First, today's workforce does not match the Nation's needs. The demographic make-up is not sustainable, and hiring rates are insufficient to replace retirements over the next 10 years.

Second, the CAIG found that every DOD satellite program had at least a 25 percent cost growth or 25 percent schedule slip, and almost half of all the programs had more than 100 percent growth in both cost and schedule.

Finally, the CAIG concluded that, "Today's DOD space acquisition strategy is not delivering well-performing programs," and "a different approach is required." Specifically, the CAIG report suggested that once a company develops competency in a mission area, the government should view them as a partner. The government should ask for incremental improvements to space systems, rather than trying to drive down cost through competition, which has not saved any money.

As you can see, the CAIG report should give us plenty to talk about this afternoon.

With that, let me turn to my good friend, our ranking member, the distinguished gentleman from Ohio, Mr. Turner, for any comments he may have.

Mr. Turner.

STATEMENT OF HON. MICHAEL TURNER, A REPRESENTATIVE FROM OHIO, RANKING MEMBER, STRATEGIC FORCES SUBCOMMITTEE

Mr. TURNER. Thank you, Madam Chairman. Thank you for your leadership and for hosting this subcommittee.

I also would like to welcome our witnesses, and also recognize Josh Hartman for his prior service to this committee.

Today's hearing comes in the middle of our full committee's legislative efforts to address defense acquisition reform. Our intent here is to examine, in greater detail, one segment of this broader issue—challenges in space acquisition and the industrial base.

Forming the basis of our hearing today is some excellent work produced by the Department of Defense's Cost Analysis Improvement Group, CAIG, and the Government Accountability Office, GAO. The data contained in the CAIG study presents a stark picture of national security space. Nearly every single defense space acquisition program is over cost and behind schedule. Our space budget is the highest to date, yet we launch fewer satellites per year than ever before. We have no inventory of satellites to provide insurance for an already fragile space constellation.

We appear to be in a precarious cycle. With fewer satellites being launched, the requirements for each grow, because that satellite must now be many things to many users. Satellite complexity grows, schedules expand, and costs balloon. High costs and long schedules mean we launch fewer satellites, and we are back to where we started. All the while, the pool of experienced personnel continues to shrink.

The principal question becomes: How do we break this cycle? How do we maintain a healthy industrial base, and keep smart scientists and engineers engaged when there are diminishing opportunities to design and build new satellites? Do we need to make fundamental changes to our space architecture and investment strategy to sustain robust on-orbit constellations and greater stability in the industrial base?

Based on the statements submitted by our witnesses, there seems to be a consensus on what should be fixed in space acquisition. These recommendations sound like common sense—realistic cost and schedule estimates, requirements matched to resources, mature technology, stable budgets, and an experienced workforce.

My question for our witnesses is then, how do we put these sound recommendations into practice? What are the barriers that have prevented them from taking root in the Department? Furthermore, with an acquisition strategy based on evolution, how do we preserve cutting-edge science and technology (S&T) and create the right on-ramps to incorporate these technologies into acquisition programs?

As our subcommittee deliberates the fiscal year 2010 budget request for space programs in such areas as missile warning, protected communications, and imagery intelligence, we will be looking to apply these acquisition recommendations and lessons learned from the past.

Lastly, the statement of one of our witnesses notes the negative impact that U.S. export control policies have had on the health of the space industrial base. Representing several of these second- and third-tier suppliers, I hear firsthand their concerns. I hope, in a bipartisan way, our committee can work together on a pragmatic approach that strikes a balance between protecting our unique, advanced space technology and capabilities and promoting a viable defense industry that competes in the global marketplace.

Our witnesses bring a diverse cross-section of government and industry views on these challenging acquisition and industrial base issues. I look forward to hearing their testimony.

Thank you, Madam Chair.

Ms. TAUSCHER. Thank you, Mr. Turner.

We will begin with Mr. Hartman. We have received your prepared statement in advance, and it will be introduced in the record. We welcome your remarks, Josh.

STATEMENT OF JOSHUA T. HARTMAN, DIRECTOR, SPACE AND INTELLIGENCE CAPABILITIES OFFICE, SENIOR ADVISOR TO THE UNDER SECRETARY OF DEFENSE FOR ACQUISITION, TECHNOLOGY AND LOGISTICS, U.S. DEPARTMENT OF DEFENSE

Mr. HARTMAN. Thank you, ma'am.

Chairwoman Tauscher, Ranking Member Turner, and distinguished members of the subcommittee, it is both a pleasure and an honor to come back to the committee and, in fact, subcommittee where I started my career on the Hill. So thank you for the privilege of appearing before you today to talk about the state of space acquisition and the space industrial base.

We live in an increasingly complex world. The future demands of the world from a national security perspective will vary widely, and we will need systems from our acquisition process that will enable speed and agility, that are responsive and relevant to that changing environment.

Past performances, as you have noted, in the development of our space intelligence systems has not given us great confidence we will actually be able to produce these systems in the future in a timely or an affordable manner. Today, we largely survive on systems that have long lived past their design lives; and, for tomorrow, we hope that systems that were built with a Cold War mentality will be delivered successfully and able to meet threats of the future.

As noted by the President and increasingly accepted across the Department, as recently as the Secretary of Defense's public statements on the budget which will soon come over to you and the Congress, we in the Department are recognizing and do recognize—for many of us, for quite a while—that, in the past, we have not been buying the right things and in the right manner. However, we have several initiatives under way that will address this.

They are: increasing the program manager empowerment and accountability; implementing configuration steering boards to manage requirements; the use of defense support teams, joint analysis teams, and independent program assessments; encouraging prototyping and competitions as well as demonstrations; and executing principle-based acquisition set upon a group of fundamentals that should be dependent, or part of any acquisition program, and not dependent upon an individual system.

So in your invitation, you asked me to specifically address the state of acquisition. My assessment of that is that current execution of our major systems has improved, but we are not there yet. There is still more work to be done.

As a whole, in the space and intelligence mission area, we can point to increasing levels of success and stability. But, as Exhibit 1 would show you, the performance of our space programs through the electro-optical (EO), the infrared (IR), the weather, the precision navigation and timing, as well as space situational awareness (SSA) throughout the Air Force, the Navy, and the National Recon-

naissance Office, as well as tri-agency efforts have been anything but successful.

The results of these programs have been a delay in critical capabilities to our intelligence customers and to our warfighters. We have put fixes in place, but, as I suggested, we haven't gone far enough.

The way that we currently buy and deploy these systems have, and will continue to produce critical capability gaps and delays in fielding those systems, especially as we move into an environment where responsiveness and dynamic tempo will be much more of a driver in our operational conflicts.

So to establish a theme that will cover throughout both my statement and, I presume, the questions, I want to quote from the executive summary of the OSD CAIG's Space Base Industrial Assessment of 2008, and that is: "The recent focus on transformational systems has hampered the execution pace required to maintain legacy capabilities. Stability in the workforce and the Department's desires must be achieved. The Department must re-examine its acquisition strategies to secure continued operational performance from these space domains. Successful programs are those that have realistic cost and schedule expectation, are well understood, have stable budgets, experienced and stable staffs, and have a spiral development acquisition strategy."

In the past, our corporate level Office of the Secretary of Defense oversight was inadequately or improperly focused. Our space and intelligence organizations operated autonomously, largely. There was not a good, strong organization to provide this oversight within the Acquisition, Technology and Logistics (AT&L) area within OSD.

But, to address this, OSD has created an organized and certified set of acquisition professionals who are space savvy within the office of AT&L, called the Space and Intelligence Capabilities Office, who will perform this function now.

So we are putting back in charge of the acquisition of these—I am sorry—the oversight of these acquisition programs a good pool of skilled acquisition professionals who will know right where to go in order to help manage these programs in the future.

Over the last two decades, the skills of our workforce and of our government folks have atrophied both in program management and in engineering. This can be attributed primarily to a training deficiency, leadership shortfalls, and an unstable investment in the space industrial base.

Today, we face a challenge with an aging workforce and low recruitment that results in junior and middle management gaps for the current state of acquisition, as well as the future. We see this in Exhibit Number 2, where you will see the older, more experienced engineers will soon be retiring, and we have had trouble bringing on younger engineers, putting them in the right programs to be able to replace that skill set.

Our programs will need technically smart people and accountable, disciplined leaders who can execute them properly. Stable funding in the industrial base, grassroots technical education efforts, and changes in the space community business model will make this area a more enticing place to work and make our recruitment goals easier to achieve.

Our most daunting problem, though, is that across the space and intelligence community we have asked the industrial base to do things that are unwise, inefficient, and often, frankly, impossible. We have attempted to buy large monolithic systems that produce a capability of "one-size-fits-all," meaning a single system that satisfies all of its users.

The philosophy of "one-size-fits-all" has driven much of our acquisition strategy since 1970; and, using the CAIG data, you can see the remarkable change in Exhibit 3, that as we move from year to year comparing the annual number of launches to the overall investment within the space community, we move from a high number of launches at lower cost to a low number of launches at higher cost.

[The information referred to can be found in the Appendix on pages 35, 37, and 38.]

So, as we progressed, we began to rely more on individual systems. We piled more and more sensors on those individual systems. We raised the complexity of those individual systems. And, in the end, we wonder why we don't find the performance that we once had.

This model, I would suggest, is a Cold War relic. It is when space systems were needed to satisfy only strategic policy decision-makers, and events unfolded in a fairly static timeline. Today's reality is that one size does not actually fit all. We need to evaluate alternatives to the large, complex systems, use less complex systems, less risky systems when we can do so without compromising the missions of our satellites that are needed to perform those critical missions. Our needs neither can be, nor should they be satisfied from one orbit with a single mega-sensor acquisition model.

There are three remaining reasons for this. First, instability in government demand caused by the mega-sensor model has evaporated much of the skills in the workforce to meet the demands in the future. Additionally, our business practices have provided insufficient volume for the sub-tier component and technology providers to remain viable or to stimulate benefits from innovation or competition.

Second, different types of users require different amounts of data, and at different times, in different geographic regions, from different sensors. For example, users in Southern Command (SOUTHCOM) might require foliage-penetrating radar or electro-optical imagery, while the capability would largely go unused in Central Command (CENTCOM) because there aren't many trees in the desert. Pacific Command (PACOM) may need open ocean surveillance of ship tracking, while European Command (EUCOM) may want to understand the pattern of low-level IR events. The operational tempos in each of these areas of responsibility (AOR) will diverge. We know there is high demand in CENTCOM, low demand in SOUTHCOM. Developing a system that can satisfy all of these users, all the time is unsustainable, if not impossible.

Third, we must begin to consider the implications of a contested environment in space. I think there is no debate that protection, dissuasion, and deterrence must be a part of our national security space strategy. Deploying architectures with constellations of just a few satellites leave the Nation incredibly vulnerable and invites

our adversaries to target our systems. The bang for the buck is just too great for them to pass up. Taking out a satellite of a 5-ball constellation versus a satellite of a 20-ball constellation completely changes the calculus and the risk for attacking our assets in space. Survivability must be a consideration in our acquisition processes; and our current acquisition model, unfortunately, only reinforces this vulnerability.

The solution is to change our business model that will enable the employment of an architecture of distributive multiple nodes, layered capabilities to provide the right layer of that capability at the right geographic regions, at the right time. Architectures should leverage commercial systems. Multiple sensors from different sizes of spacecraft and non-space platforms should be an integrated architecture that weighs the benefits of those multiple sensors and those multiple media in which we need the capability for our warfighters.

This model will provide for a balanced architecture where a foundational capability will provide for medium or large systems. At the same time, small and agile, less complex systems would be layered to augment in optimized orbits with additional capability in high-demand areas, or niched capability for special operations, irregular needs, or crisis situations.

As recommended by the GAO and by the CAIG, evolution of capability would be a hallmark and a key tenet of this model. Systems would purposely be designed to live shorter lives to reduce the system complexity and the amount of redundancy required. It would synchronize on-orbit life with development time. It would increase industrial volume and take advantage of rapidly advancing technology.

This new business model would have multiple benefits in the industrial base, the government workforce, and the capability of our warfighters. It would shorten cycle times, allowing for the quicker fielding of assets. It would allow for larger volume purchases and, as I suggested, a greater technology refresh rate at a time when technology changes quicker than we can launch systems.

It would produce a more stable workforce due to the synchronization of development time and mean mission duration. This is really very important, and I want to try to highlight why that is important.

If I build a system that takes me 8 years to build and it lasts for 15 years, I immediately have a disconnect between the workforce that is rolling off of a program and then should be rolling on to the next program. I have got to find something for that workforce to do for the next eight years until the replenishment of that satellite is needed.

This new model will reduce overall program risk. It would raise confidence in delivery at a time when, frankly, the users have little confidence in our ability to deliver. It would generate efficiencies that our current system does not produce; and, due to the shorter development schedules, it would create a continuity of expertise, a sense of ownership of individual systems by the workforce, government, and industry, which would increase morale and the attractiveness of the space field, having a positive effect on recruitment.

The model would restructure competition and reinvigorate innovation through a focus on new payload and subsystem developments. The competition model that we use today is to compete in the entire system but a bus—a satellite bus is a satellite bus. I am oversimplifying a little bit. But the true innovation comes at the sensor and payload level, and that is how we ought to structure competition.

Last, this business model would architect survivability of space assets by design, making it more difficult and costly for an adversary to negate our space capability. Adversaries rarely play to each other's strengths, so we shouldn't be surprised that future adversaries and future environments don't conform to the results of a "one-size-fits-all" acquisition in architecture.

We shouldn't presume that our warfighters will be taken care of under this model. We shouldn't presume that industry can produce under this model. As a result, we should adopt a new business model and implement these new architectures for our space and intelligence systems.

I believe all these changes can be appropriately introduced to produce the desired results. However, many of the problems I have talked about are enmeshed in our culture, and this culture has to change. Congress has a role in helping the Administration reinforce that cultural change.

I look forward to working with you and answering your questions today.

Ms. TAUSCHER. Thank you, Mr. Hartman.

[The prepared statement of Mr. Hartman can be found in the Appendix on page 29.]

Ms. TAUSCHER. Ms. Chaplain, the floor is yours.

STATEMENT OF CRISTINA T. CHAPLAIN, DIRECTOR, ACQUISITION AND SOURCING MANAGEMENT, U.S. GOVERNMENT ACCOUNTABILITY OFFICE

Ms. CHAPLAIN. Thank you, Madam Chairwoman and members of the subcommittee. Thank you for inviting me today to discuss this topic. It comes at a critical juncture for the space acquisition community.

First, it is clear that there are acquisition problems that continue to restrain the ability to invest in the future. Second, there has been recent cancellations of programs that actually represent that future DOD was hoping to get to. Third, DOD currently faces culture capability gaps in very critical areas: protected communications; weather surveillance; space surveillance; navigation, timing, and positioning. And, fourth, there are concerns about the capacity and leadership and that we are losing our edge in space technology.

My testimony today is going to focus on the condition of space acquisitions, the causes, and the solutions; and I believe you will see a lot of commonality between what Josh said and I said. I think that is a good thing.

On the condition of space acquisition, we continue to find large cost overruns in space programs, adding up to billions of dollars and schedule delays adding up to years. In fact, some programs we thought were going to be on a better track last year saw some setbacks this year.

Just a couple of examples. The Advanced Extremely High Frequency (AEHF) program ran through some more delays this year because it had encountered design and workmanship problems in the process of integrating the satellites. Last September, the program reported a unit cost about 130 percent above the baseline due to both technical problems and a decision to buy another satellite.

The National Polar-orbiting Operational Environmental Satellite System (NPOESS) program, which is focused on weather and environmental study, continued to experience problems in development even after being restructured shortly—just a year or so ago. The launch date has slipped from November 2009 to January 2013. It is a three-year delay. The original life-cycle cost was $6.5 billion. It is now $13.5 billion and likely to go higher.

Why is this happening? I think what we see in our reviews is consistent with what the CAIG saw, the Defense Science Board has reported, and other committees and study groups have said.

First, there is a tendency to start programs too early, before technologies are fully understood, before requirements are settled, and before we even have agreements between the community on what the system represents and how we are going to use it together.

Two, space programs are increasingly ambitious. In terms of requirements, as Josh mentioned, we are trying to build satellites that are more monolithic and serving too many communities, but also ambitious in terms of schedule that seems to be immovable and creates a lot of pressures on the program.

Third, there is a lot of optimism in the planning phase in terms of cost and schedule. We performed a review for this committee a couple of years ago, and in virtually every major space program, we found very consistent optimism across a number of categories, including things like industrial base capability, technologies, requirements, stability to fund the programs.

Fourth, there is a diversity of stakeholders in space that you don't see in other weapons programs. So this is an added difficulty to space acquisitions that we don't see on the other side of weapons. Some programs involve all military services, various Pentagon components, various components in the Air Force, Strategic Command (STRATCOM), potentially the NRO, potentially the National Geospatial-Intelligence Agency (NGA), and even outside agencies in cases like the Global Positioning System (GPS). There is no one really at the top to negotiate all these competing priorities and try and focus on getting acquisition and being able to make those top-level decisions.

We have identified a number of other factors in our review that I think have been identified by others as well, one being funding shifts within the programs. Ultimately, some programs become bill payers for other programs, and that caused the delay in the start of the GPS IIIA program, which is now facing a lot of schedule pressures.

Also, there are gaps in the workforce. As you heard from Josh and you will hear from others today, when we go to program offices ourselves, we see big gaps in the program offices. A lot of key technical and business positions aren't being filled, and often the people we see who know the most about a program are the contractor employees or the Federally Funded Research and Development Cen-

ters (FFRDC) employees versus the government employees. When we did our cost-estimating review for this committee, we also found gaps in cost-estimating expertise.

Another issue is short program manager tenure and lack of accountability. Another one is the lack of funding for testing articles in space. In fact, a lot of people have said over the years it seems like there is more an aversion to test and fail before an acquisition than to try new things and to see failures and wring out the risks before you can begin an acquisition. These days, there is not enough funding to be able to even test in general.

There are some factors we have identified that are tied to the industrial base. Consolidations in the space industry have resulted in less competition. Conversely, there has been a desire to compete and go with a lower price, which has resulted in going with contractors who don't necessarily have the expertise needed to complete that program. In fact, on a few programs you hear complaints that we have "lost the recipe."

There has also been the consolidations during the 1990s with the emphasis on acquisition reform. When it was implemented in the space world, it was really more of a relaxing of oversight and quality assurance activities that really had an impact on the things like quality of parts and systems engineering that has had a big impact on space programs. That happened within government and within industry.

Also, there is a gap of technical workforce in the commercial sector that we have seen reported by a number of study groups. So it is not just happening in government, it is happening in the commercial sector.

I would like to note, though, that we have visited a number of commercial satellite suppliers in a recent review, and they each told us they feel like they do have the workforce they need to do their work.

When it comes to a solution set, I really believe there is broad agreement between what we are saying, what the CAIG is saying in its report, what the Allard Commission said in its recent study for these committees, and what has been said by many others over time, and also the solutions, I believe, is what is being advocated for the entire weapons portfolio. And they are very simple tenets that were suggested by the ranking minority member.

First, more achievable requirements; second, more up-front understanding of technology; third, strengthened leadership; fourth, stability in funding—and that means setting priorities to which systems receive the highest and so forth. Next, is strength in workforce. And also that comes with giving good incentives to program managers and ensuring they stay long enough so they can be held accountable for the decisions that they make.

Next are the types of solutions that Josh has been talking about, kind of looking at solutions that focus on smaller kinds of satellites, more achievable systems, and programs that stay in production for long periods of time, that constantly are renewing themselves so you are constantly renewing and strengthening the industrial base.

The CAIG also noted in its study a need for stability in contractors with specialized expertise. We agree that programs that have switched contractors who don't necessarily have the expertise to do

a program has caused problems. But when you talk about an approach that is going to stick with one contractor for a certain kind of capability over multiple programs, there are some cautions that need to be kept in mind.

One is you still do need competition at some level. Josh suggested that would be at the payload or sensor level, and we would agree with that at GAO.

Second, you still want a process where you are going to encourage new entrants into the acquisition process. They are the ones that give you the opportunity to innovate and get better value. And there are some programs in defense—and the National Aeronautics and Space Administration (NASA) focused on getting new entrants. We just need to maintain that focus and make sure it is well resourced.

Third, under any conditions, you need strong oversight on the government's part. It is more important than ever if you are sticking with one contractor, program after program, that it is difficult to do when you have deletions in program management capability and oversight on the government side.

Last is just to keep in mind that stability in contractors is not the only fix that we need for space. There are other issues here that really need to be addressed, one being making sure technologies are well understood before a program begins; making sure requirements are understood and remain stable; making sure funding remains stable; making sure tenure in program managers is at a length that ensures accountability; and making sure you have the leadership over all space programs.

What is being done today, there are a lot of good actions being undertaken. At the DOD-wide level, there are actions designed to strengthen program managers and to make them more accountable. There are actions designed to improve the investment process so that you can focus better on priorities.

At the Air Force level, there are a lot of actions going on in the area of cost estimating. There is emphasis on a back-to-basics policy that focuses on evolutionary development, not biting off more than you can chew.

On individual programs like the GPS IIIA program, there are a lot of good decisions being made upfront to better position those programs for success.

At Congress, there has been legislative proposals—one of which was discussed this morning by the larger committee—that have a very broad span of actions designed to increase knowledge upfront and better execute programs throughout.

While there is widespread agreement on what needs to be done, you still need to make sure that there are larger changes in the planning, budgeting, and acquisition processes that sync up to these reforms that really establish priorities. You also need to ensure that there is accountability in this process, something that has been hard to do, to date. You do need, as Josh said, changes in the culture and mindset to accept these kinds of changes, even a different kind of architectural approach that focuses on small, more achievable, versus large, exotic, monolithic.

I don't want to diminish the good things. Even with all these reform efforts, I really believe a focus needs to be really strong on

just maintaining the capability we have and ensuring that we don't face capability gaps in some of those areas I mentioned.

That concludes my statement. I am happy to take any questions you have.

Ms. TAUSCHER. Thank you, Ms. Chaplain.

[The prepared statement of Ms. Chaplain can be found in the Appendix on page 42.]

Ms. TAUSCHER. Ms. Blakey.

STATEMENT OF MARION C. BLAKEY, PRESIDENT AND CEO, AEROSPACE INDUSTRIES ASSOCIATION

Ms. BLAKEY. Thank you.

Good afternoon, Madam Chairman. I appreciate very much the chance to be here with you all this afternoon and to be able to speak before this distinguished panel. Ranking Member Turner, thank you very much for the opportunity.

Before I go on, I would like to congratulate you, Madam Chairman, on your new nomination, too. Needless to say, we are very enthusiastic about the prospect of having you as our Under Secretary for Arms Control and Nonproliferation. So we look forward to having you in that role, as well.

Ms. TAUSCHER. Thank you.

Ms. BLAKEY. It would be hard to overstate the importance of our national space infrastructure. Security space infrastructure is absolutely vital to our country's overall high technology capability, and it supports virtually every aspect of our modern military and civilian way of life. The space industrial base also accounts for thousands of high-quality, high-paying jobs; and this, of course, is critically important in today's economy.

There are several challenges that we see as posing specific threats to the national security space industrial base. The first challenge is the shrinking aerospace workforce. America's scientists, engineers, and other technical workers are the core of our Nation's space industrial base. But we have real concerns that, as the current generation ages and retires, we are not renewing the workforce to keep America at the forefront of technology development.

According to a survey that we did with Aviation Week—the aerospace industry has tackled this very issue, and we found that more than 60 percent of our aerospace workforce was age 45 or older, and many are near or in fact at retirement age at this point.

Indications show that there are not sufficient numbers of high school and college-age students studying science, technology, engineering, and mathematics (STEM) to replace the generation of workers that are about to retire. And the shortfall of experienced workers ages 35 to 40 calls into question the ability of our industry to meet the Defense Department needs.

The second challenge is the defense acquisition process itself. Both government and industry have the goal of providing the best equipment possible, at the best value to taxpayers just like you and me. There is room for significant improvement in DOD's process, which is hampered at this point by size and complexity and instability in important areas like requirements and budgeting.

The last challenge is our outdated export control system, which directly hampers the aerospace industry's ability to meet Defense Department needs, as you noted, Congressman Turner. The U.S. export control system has negatively affected the Nation's space industry, particularly the network of supplier companies that provide the components for our space programs.

The United States used to dominate the global satellites export market until the rules changed about 11 years ago that put commercial satellites on the U.S. munitions list. As a result, our share of the export market dipped below 70 percent—dipped from about 70 percent in 1995, to about 25 percent in the year 2005. Those who know the details of the change, know that the intention behind this was good, but clearly the results have been disastrous and directly impact the industry's ability to provide the equipment our warfighters rely on.

We have several recommendations to preserve the health of the national security space industrial base. First, the Administration should establish a national space management and coordination body that reports directly to the President. We believe they should have the authority to coordinate, across departments and agencies, all of our space efforts.

Second, officials must support and invest in the science and education national priorities that we have detailed. This, of course, first and foremost, are the STEM initiatives to address this workforce challenge.

Third, the DOD should implement management practices that promote requirement stability and accurate cost estimates, just as the other witnesses here today have noted, because this will ensure that programs can come out on time and on budget.

As articulated by the Office of the Secretary of Defense Cost Analysis Improvement Group, the CAIG, I also will quote from their report: "Stability starts with government's funding and plans, leads to an efficient and productive industry workforce, and results in well-performing programs that deliver mission area success." First and foremost, again, stability.

Lastly, I would note that lawmakers and the Administration do have to take concrete steps to reevaluate the International Traffic in Arms Regulation (ITAR) controls on commercial satellite technologies. This is very important, and we believe it needs to be addressed at this point.

So, in closing, it is absolutely vital that we continue to maintain and upgrade the national security space systems, adequately protect them, and ensure the healthy industry base that is going to be needed for their development.

Thank you, again, for the opportunity to be here today.

Ms. TAUSCHER. Thank you.

[The prepared statement of Ms. Blakey can be found in the Appendix on page 64.]

Ms. TAUSCHER. I am going to begin with questions.

Mr. Hartman, in your testimony, you describe actions to empower program managers, create steering boards, provide technical support, increase competition, and practice principle-based acquisition. Yet, I am still not clear how the Department intends to estab-

lish stability in industry, and which programs offer procurement of a very small number of highly complex items.

Specifically, with the cancellation of the Transformational Satellite (TSAT) program, what actions will the Department take to retain industry engineers and scientists involved in protected communications?

The second, sub question: How would you recommend managing the missile warning business post-Space-Based Infrared System (SBIRS) to avoid another major disconnect in this business line?

Mr. HARTMAN. Thank you for the questions.

Protected Comm is a national asset. We will continue to have demands in this new environment that I mentioned that will force us to move most of our Comms, we believe, to protected assets.

In the future, in light of the cancellation of TSAT, we will look at how to implement additional capabilities on Advanced EHF and the WGS—Wideband Global Positioning System—and begin to look at, as I suggested, a layered approach to finding that additional capability from a protected and anti-jam perspective.

We are just in the midst of cleaning up all the pieces after the cancellation. There is lots of potential technology harvesting that should and will take place as a result of the nearly $3 billion we spent on TSAT that will become the foundation for the future plans for that augmentation to advanced EHF or additional free-flyer systems to produce that layered architecture I talked about.

Ms. TAUSCHER. How do you make sure that the technology that is harvested actually has a human capital component to it that we don't lose?

Mr. HARTMAN. We have been working with the two prime contractors and their subs to take a look at the next level down, primarily focused at their sub-vendors. In the space industry, the primes don't really have the core of the expertise to produce these systems. That strength comes from their subs. So we realize that the strength in that workforce-protected Comm will result in investment in the sub-tier. So we will look at the right arrangement with industry to maintain that workforce level.

Ms. TAUSCHER. I think the things that you described earlier, and that Ms. Chaplain talked about, too, when you have long lead on a lot of these systems, and it takes five, seven, longer to actually develop and put these things in orbit, you have got to understand that there has got to be something for people to do in the meantime. Whether we have a blended solution that includes a suite of acquisition—I think part of what we have to do is understanding that very few of these things are, in and of themselves, the totality of what we are looking for.

So I think very much like they do in the computer business—they went from selling boxes to selling suites—because you have to stretch out the capability of your workforce to continue to work while you are in development of new things.

Perhaps what we have to do is to look at a suite of systems and make sure that when we are doing acquisitions, we are not buying onesies and twosies. We are buying enough to keep the capabilities fresh, to keep the workforce energized, and to have a very aggressive outreach to universities and colleges, and where we are really dipping down into high schools, frankly, and making it very clear

that these are robust jobs, good-paying jobs that have a long life, and that you are not going to be out on the street every time somebody decides to either cut the funding or switch to something else.

So I think that there is a combination. I know Mr. Turner and I talk about this offline quite often. I think that you could get a lot of bipartisan support in—both the industry and the Administration could get a lot of bipartisan support in taking that approach so that we weren't finding ourselves always trying to figure out how to patch things together when one situation doesn't meet our expectations.

I am going to pause here. I have a number of other questions both for Ms. Chaplain and Ms. Blakey, but I am going to yield to the Ranking Member, Mr. Turner.

Mr. TURNER. Thank you, Madam Chairman.

I have got one question about the CAIG's recommendation, and then I want to get to the trade issue.

The CAIG is recommending a 20- to 30-year long-term program and resource plan for the national security space enterprise. What are your thoughts on such a plan?

Mr. HARTMAN. I think in the current business model that something like that has to be done, because it takes us 10 years to produce a system. So in order to develop that continuity that Congressman Turner talked about, you have to look that far in advance.

But I would argue that that would be a difficult process. It will be a process that changes a great deal. And the reason why is in the space domain, the users are very unsophisticated at this point. They have a hard time articulating what it is they need 2 years from now, let alone 20 or 30 years from now. When you match that with the quickly evolving pace of technology, it is very difficult for me to put together an architecture and a capability plan 20 to 30 years from now. So that is why I think it is important for us to restructure the business model and allow us to be able to field systems in a 2- to 3-year period or 4 to 5, rather than this 10-year period we are currently on now.

Mr. TURNER. My biggest concern, in addition to the export controls in the industry, is the concept of innovation. It would seem to me that although you can tell if you have a 20- or 30-year plan what your current capability gaps would be, what you can currently do that you are going to lose, it would seem very difficult to project what needs you might have or what ingenuity that might arise, causing you to be interested in a new technology that you are not currently pursuing.

That also goes into my concept of is this workforce, the fluctuations in demands—you are not going to be getting—the opportunity for ingenuity frequently happens on the shop floor when someone is tinkering with something, not when someone gets a contract with a spec requirement that someone did at their desk. That tinkering, that ability to work with what you are doing, gets suppressed when you have these spurts and then valleys.

Mr. HARTMAN. Sir, I think a great way to describe what you just talked about is, in a model that forces us to look that far in advance, we are forced to use invention rather than innovation. Innovation, as you suggested, is taking today's capabilities, tinkering

with them, to produce results in the near term, as opposed to producing a big-bang sort of invention that will satisfy our needs in a 20- to 30-year timeframe.

Mr. TURNER. Ms. Blakey, your thoughts.

Ms. BLAKEY. I think we do need to pay attention to the opportunity, though, for both invention and innovation. And research and development (R&D) is at the heart of this, having enough funding and enough support for R&D and, frankly, a tolerance for failure. Because it does, at times, come down to that. Are we willing to take some risk to make leapfrog technologies happen?

So all that, I think, is what the industry is very eager to offer, if we have the support to do it.

Ms. TAUSCHER. Mr. Chairman, could I ask you a question? I think what Ms. Blakey just talked about, I think, is part of the nut of the problem. Part of the problem we have got is that so much of what we are doing is not R&D but actually trying to put things out. And if we could bifurcate, like the real world tries to; if we had a constancy of R&D, instead of trying to do R&D on a job, because you don't have funding for R&D. Instead, you have to wait to get the job, and then you do R&D and try to call that the job, but, in truth, you are still trying to spiral-up to get the capability.

You and I have talked before about a constancy of R&D and a way to have that happen. Clearly, we have got a private sector that would like to spend more in R&D, but they don't get paid for that. I think we should try to talk together as to what ideas you all have.

For me, what Ms. Blakey just said reminded me of the fact that, for a long time, we were forcing the private sector to effectively do their R&D on the job. Wait until they get the contract and then try to push ahead. A lot of this is on the move, and what we need to do is have much more of an invested, consistent, predictable R&D base. Then I think you actually pretty much know what you are going to get when you buy something. Because they have developed it, not just dreamed it up, and then you can control—considering the fact you can't control much—but you can control for some level what the cost and what the deliverable will be, instead of having a lot of this on a wish list called a contract.

Mr. TURNER. That would be great. Those are excellent points. You are close to advancing a product. You are advancing knowledge. That, then, can lead to products. That is excellent.

Ms. TAUSCHER. Thank you.

Mr. TURNER. The export control issue is one that I am very interested in because, as you were describing, Ms. Blakey, you said that we had 70 percent and then went down to 25 percent in the market. Although we recognize, as you did in your comments, that there are some things we don't want to put out in general commerce or in the hands of just anyone, it would seem that since someone else is satisfying that market that someone else has the knowledge and capability and is selling knowledge and capability, so the end result is people have some technical capability and that we ought to be able to have an opportunity to commercially participate in that.

We certainly have the review process when someone asks to export something. I wonder what you know of, when we do that as-

sessment, what is lost. We are down to 25 percent. Is that gap one that we are prohibited in participating? In other words, I might have the best widget, and the export control says, "You can't give them that."

Is the competition providing the equivalent, or are they providing something less? And who would be doing that? How do we know what is out there in the commercial area that we are losing as we try to address this issue of export controls?

Ms. BLAKEY. Well, I continue to believe that U.S. industry can provide the finest technology out there. In terms of quality, unparalleled. So I genuinely believe that we still can be highly competitive in this arena, despite the downturn that the ITAR restrictions have caused for us.

When you have companies out there worldwide, advertising that they have ITAR-free satellites that can be immediately contracted for, and those who are needing the service say, "We would like to have the U.S. quality, but in fact the delays, the problematic nature, perhaps it won't happen," all those kinds of things really do put a tremendous drag behind our capability.

And I would also go to your point earlier, Congressman Turner, and that is we are talking about the second and third tier of smaller, specialized providers, that those suppliers are really not in a position to go through all the hoops that ITAR often requires, and so they have to content themselves with supplying only to the U.S. Government. And that is a very thin support at times for those companies.

Mr. TURNER. Mr. Hartman, any comments on export controls?

Mr. HARTMAN. I think—I won't go into great detail, but I think the current regime has been burdensome. I think it was developed at a time when it was to address specific needs at that time 11 years ago, as Ms. Blakey said. We exist in a new global environment, and I think the new regime needs to adjust to that new global environment to make our industry more competitive overseas and to allow the partnerships that I think we are going to need for the future to be able to bring the capability to the users of space systems.

Mr. TURNER. I think there was a time when the U.S. economy was viewed with such vastness we thought there were areas we could take hits in by being overly restrictive. Now, as we are in these economic times, it shows there are areas that we need to be competing in in order to thrive.

But I do also think it goes back to the issue of ingenuity, that the more that we are doing, even in the commercial side, the more we are going to have. As our chairman was saying, that the concept of R&D can have an alternative source of funding, also, to support operations.

Thank you.

Ms. TAUSCHER. Thank you very much, Mr. Turner.

We are now going to go to five-minute questioning. I want to thank all the members for coming. We have a large cadre of members here, and I appreciate that very much. We are going to go to Mr. Larsen for five minutes, the gentleman from Washington.

Mr. LARSEN. Thank you, Madam Chair.

Ms. Blakey, I don't want to sound critical of the term "tolerance of risk," but this chart that Mr. Hartman had is why the tolerance may be at an all-time low for risk here in Congress and, as well, why we're looking at an acquisition reform bill in the full committee that Ms. Chaplain outlined. It is because of the cost increases, the budgets and schedules being far above what anyone planned. I think until we get past that—until we can get through acquisition reform, that the tolerance for risk might continue to be fairly low, which probably doesn't spell out a very good future in terms of the budgets that we have seen in the past, especially in the satellite programs we have overseen here on this committee over the last several years. It has been a point of frustration for a lot of us.

I do want to, though, ask you a little bit more about the export-control issue. I think you are absolutely right-on with regards to the problems with ITAR and the ITAR-free advertising. But, as well, the point Mr. Hartman made about, perhaps 11 years ago, it might have been time for the particular export-control regime we have—let history judge that—but can you speak to this point: I have been over to China, the China Academy of Science and Technology, which is where their satellite showroom is located, basically. They will put you in a car for $5,000. The whole design of this place is to go around and show other countries who want to be involved in space activities, commercial or otherwise, to show folks what the Chinese can offer.

In other words, the export-control regime certainly hasn't seemed to stop any other country from moving forward on satellite development, satellite launch, commercial or otherwise.

And so, looking at this export-control regime, it seems to be something we want to do because it certainly hasn't achieved its objective. If we still come to the same conclusion that we want to have it the way it is, then let's do that intelligently, rather than blindly, which it what it seems we are doing now.

Can you comment on that?

Ms. BLAKEY. No, I think that is exactly right. I think that we all agree that for truly sensitive technologies—technologies where we are maintaining our national security based upon very fine technologies that should not be allowed outside of our country or only in a very trusted community of allies—that is set aside, and that we should focus more on, in fact, being very careful on those.

But in the commercial world where, just as you say, this is widely available and it really is a question of being competitive on the basis of quality, reliability, deliverability. We could and should compete there in a way that we are just not able to with the current, very outdated system and list. So that is what we are asking for Congress to take a good look at, because we do believe at this point, it is time.

I should also probably be clear in my remarks earlier in talking about risk, because what I was going to was not on specific programs where there is a deliverable and you have got both cost and budget deadlines that must be met. We are actually proposing a number of reforms on the acquisition front because we believe it must be much more reliable and effective.

But R&D, our country right now is underfunding, we are underinvesting, and, honestly, this Congress could address this. Because making the R&D tax credit permanent so that we in industry know what to count on, it may not seem that large, but without that stability, living year-to-year, hand-to-mouth on this, it is not the way you are going to get the kind of robust investments, whether it is industry or government funding, that is at issue there. And the industry would like to step up more.

Mr. LARSEN. Mr. Hartman, would you say that the CAIG recommendations would be consistent, or nearly consistent, or not at all consistent with what Secretary Gates has said about trying to get to a 75 percent solution rather than a 99 percent solution?

Mr. HARTMAN. I wouldn't want to speak for the CAIG. We have Steve here to talk about that, if necessary.

But I think, in talking to Steve, my assessment of what the CAIG's recommendation is is completely in line with where the SECDEF is. The SECDEF has talked about the need for "good enough." He didn't specifically mention space systems. But it is very applicable to space systems, and it goes in line with the business model that I was suggesting.

And, in the context of requirements management and expectation management, we ought to spend more time working with the users to explain to them really what a space system can do for them and the timeline associated with being able to produce this capability; letting them know that in three years we can give them this good enough capability and continue to shoot in the next evolution toward what their end desires are.

Mr. LARSEN. I just want to conclude by saying sometimes ho-hum works better than whiz-bang, which sometimes never works.

Mr. HARTMAN. Absolutely.

Ms. TAUSCHER. Let me give members and our witnesses the state of play. We are about to be called in about 15 to 30 minutes for an hour of votes. Today is Thursday. This is "get out of town day," as we call it. So I want to give members a chance to at least ask a question, and then if we still have time before the votes are called, we will go through it again.

We have got four members with five minutes each. If members have more lengthy questions that are more substantive, if you want to submit a question for the record, please feel free to do that. Those members who have already asked questions are free to do that, too.

I want to turn to Mr. Franks of Arizona for five minutes.

Mr. FRANKS. Thank you, Madam Chair. I will try to not abuse the time here at all.

I appreciate all of you for being here. I think we all do. It is a critically important subject, and it is reflected in some of your testimony. Of course, the United States can't afford to do without the national security space system. It is not only critical to gathering information related to terrorists and unfriendly nations' weapons programs, our military leaders would be completely blind without what all of you do. I certainly thank you. I know the whole committee does.

Mr. Hartman, I know that a lot of this has been covered, but acquisition in the Department of Defense is obviously a notoriously

kind of slow and inefficient and costly process. Sort of a bureaucratic challenge. It is not to demean the Department. It is just a complicated job. And that reputation is especially true related to space acquisitions.

Sometimes Congress tends to think that the solutions come in the form of greater oversight, creating more offices and programs. Is there anything that you think that we can do away with or add, notwithstanding Ms. Blakey's suggestion, to make the circumstances better? What do you think is currently being done that would resolve the bureaucratic condition of the space acquisition program?

Mr. HARTMAN. Sir, I think I would recommend three things that Congress could focus on. First is helping the executive branch toward consolidating and establishing strong leadership in the space and intelligence community. That would clarify a lot of the problems. It would focus us in on the requirements and investment issues that we continue to have in the debates.

The second thing I would do is look at finding ways to encourage the Department to fully fund programs through the entire—through five years of our planning cycle. Our resource team tends to focus on the year of execution, which is the most important year. It is the year that we bring the budget over to you. The problem is that, in a planning perspective, many of these programs are often broken in the outyears, and we find ourselves in what I call the "Wimpy Syndrome," for those of you who are familiar with Popeye: I will gladly pay you Tuesday for a hamburger today.

The suggestion is they will fix the funding disconnects during the next budget cycle. And it is not a sound way for a program manager to be able to expect his funding to come through. That stability needs to be able to exist through that planning process.

The third thing I would do is—and I think, Mr. Turner, you touched on this a little bit and, Ms. Blakey, you talked about the importance of R&D. Investment in invention ought to happen in the science and technology world. We ought to reinvigorate the lab system and build that linkage between the S&T community where invention ought to happen so that we can then innovate inside the program offices.

Ma'am, you mentioned the same thing. We should no longer be trying to work technical miracles within the program office. We should be doing those things before the program ever comes. And one of the key ways to do that is something that the committee did back in their authorization act in 2006, which was to direct the executive branch to develop the science and technology plan. It happened, and then it stopped happening. And that needs to be a continual thing.

It is focused on space. There is a larger science and technology plan, but one for space needs to also happen. And it needs to have the buy-in of not just the science and technology community, but the acquisition community. It ought to be connected to each other.

So those are the things that I would suggest that Congress would be the most help on.

Mr. FRANKS. The Operationally Responsive Space (ORS) initiative has, as you know, enjoyed some pretty significant bipartisan support. What do you think—how can it help mitigate the risks of

capability gaps, whether it is positioning or navigation or timing or missile warning or communications even of weather? How can we use that to help mitigate these capability gaps?

Mr. HARTMAN. Sir, I think the way that you pose the question is a great way to look at it. ORS is not a blanket solution for all of our capabilities. There are certain ways that ORS can play in individual mission spaces; weather, for example. There are some commercial opportunities out there that will allow us to buy data to satisfy—or to keep requirements away from the end-post program or future weather satellite systems. We ought to find a way to integrate that into—that is the Tier-1 ORS solution.

They are looking at that same model for radar right now. And we are, in the U.S., behind our international competitors when it comes to a Tier-2 radar, meaning not the exquisite stuff. We are, because of the industrial base—lack of industrial base investment in the R&D side and on the operational side by the U.S. Government, forced to look for international partners for satisfaction of mission capability within that realm, bring in another Tier-1 capability.

But, as I talked about earlier in that business model, the architectures we ought to employ ought to be layered. They ought to be focused on geographic areas. They ought to use optimized orbits, niche capabilities. ORS would play a great role in providing that top layer. It is not going to satisfy all of the mission requirements. It is going to satisfy those specific mission requirements for that specific joint forces commander. And I think you can do that in all of the mission areas. Positioning, Navigation, and Timing (PNT) is one that you mentioned. But imagery, whether it be radar or electro-optical can be one, or IR. I think that the opportunities are boundless when it comes to looking at the ORS applications from that perspective.

Mr. FRANKS. Thank you all again; and thank you, Madam Chair.

Ms. TAUSCHER. Thank you, Mr. Franks.

Mr. Langevin of Rhode Island for five minutes.

Mr. LANGEVIN. Thank you, Madam Chair.

I want to thank the panel for what has been a very fruitful discussion.

A lot of the issues that I have had concerns about have already been asked or the panel addressed them. I appreciate, Ms. Blakey, you addressing the issue of lack of support, investment in the STEM programs, encouraging our young people to go into those programs. I share that concern as well, and have pursued a number of opportunities where we can provide more support in those areas, especially the younger ages.

We have got to encourage more of our students to go in there. It really is a national security issue at this point. We are losing our edge in the area of math and science, engineering and such. So we obviously have to do more in that area.

I share the concern, also, about the issue of export controls. We have our foreign partners or competitors putting out satellite capabilities that are pretty robust, and our industry is prohibited from exporting our technology. I understand clearly we have got to be concerned about our national security and not letting our best R&D technologies out that could be used against us. It would be a dis-

advantage. But the commercial sectors in other countries have developed these capabilities and are available to foreign competitors. I think we need to really look at our export controls in wondering is it—it is clear we need time to revise those export controls. And, obviously that has important implications for our industrial base as well.

I also agree with the issue of—you know, one of the problems in rising costs and acquisition, we need acquisition reform on the issue of R&D on the fly. Sometimes this issue of doing too much, too soon just doesn't work.

And another thing, in addition to doing R&D on the fly as we go, is these changes in mission requirements as we go, trying to—you know, you start out with one set of requirements and then you do the add-ons, which are an increasing problem.

The other thing that maybe you can comment on is the issue of focusing more in developing a common bus so that as technology upgrades are achieved that it can be achieved more cost effectively. It is easier to do it and upgrade.

Do you want to——

Mr. HARTMAN. Yes, sir. I think that is an important initiative for the future. The reality is that there are—there has been common buses. Our current primes have common buses. But there are several different kinds of common buses.

What we are looking at doing—and this is primarily done through the Air Force research lab in the ORS office—is developing common standards across the industrial base that will allow us to plug and play and, as we talked about earlier, focus the investment and innovation and competition on that sensor and payload level, as opposed to the bus level.

Mr. LANGEVIN. Let me ask you this: Secretary Gates has recently announced the decision to cut the Transformational Satellite program instead approaches two more bands Extremely High Frequency satellites as alternatives. What will this mean for our communications satellite industrial base, and how will this affect other major satellite acquisition programs? And will the fiscal year 2010 budget reflect a commitment to prioritizing space acquisition programs?

Mr. HARTMAN. Sir, I think the cancellation of TSAT and the investment of the Advanced EHF satellites, as you noted, will—what it will mean is the first step in what we have talked about here today, is evolving systems and not putting too much risk on an individual system. We will have to resist the pressures from ourselves to try to pile too much investment into advanced capabilities within both the WGS and the Advanced EHF systems. So I think that if we do this properly, it will be as I suggested, that first step moving in this direction.

With respect to the priority of space systems, I don't know what the total amount is for investment, but I think it will largely remain static. It will be a decrease from last year's investment in overall dollars associated with the space industrial base sector.

Ms. TAUSCHER. Thank you.

Mr. Langevin.

Mr. LANGEVIN. I yield back.

Ms. TAUSCHER. Thank you.

When a plan comes together—we are called for five votes, and we have Mr. Thornberry of Texas for five minutes.

Mr. THORNBERRY. Thank you, Madam Chair.

I appreciate you all's testimony. Particularly, Ms. Chaplain, Mr. Hartman, you all seem to agree on everything. And I have been in lots of hearings over the past several years where there is lots of agreement on the problem. You all are in agreement on where we ought to go, but it seems to me the problem is getting from here to there.

You both mentioned things like culture and so forth. It is hard for us to pass a law to fix culture, I have found out. And I have tried to listen carefully to all of your suggestions: fully funding R&D, putting all the money in the fight-up for a program, and so forth.

But it seems to me that in a number of cases, we find ourselves just trying to fill a hole or plug a gap or meet an immediate need; and, therefore, that R&D money is the easiest money to squeeze. It is nice to think about going to a real common bus or so forth, but we just have to—it takes all we can do just to do what absolutely has to be done, what the warfighter has grown dependent on, for example. So do you have any other—I don't mean other suggestions, but do you have any more guidance for us on how to get from here to there?

Mr. Hartman, you work in a big building. Not everybody would agree with all of the things that you have laid out, although it sounds perfectly reasonable to me. But either of you, how do we get from here to there and over that hurdle that seems to stop us?

Mr. HARTMAN. You are right. It is a very big building. And that is exactly the trouble that we will experience in implementing something like this. The role for Congress is to keep this issue front and center and to speak about how important this is. It will force that attention that will be required to make these changes.

But the problem that we are going to have, frankly, is that, under what I would expect to be static defense budgets over the future, there will be little room for new capital investment inside the space community. So the progress that we will be able to make will be similar to my response to Congressman Langevin's question. We will have to, because of survival, evolve our system. What we will have to do is save ourselves from each other, and that is to resist piling additional capability on these systems.

This change is going to have to take place over several years. It is going to be much like we are talking about, evolving our systems. It is going to be an evolutionary process, and that first step is to force us to take what we have, stretch it out and slowly push it into the future.

Ms. CHAPLAIN. I would comment that the condition today has not always been the case, and there was a time when we did get a lot accomplished. There was cost growth, but not to the extent that you saw today. And there was a lot of reasons why that occurred.

I think we kind of need to go back to that time to the extent possible. That means things like reducing complexity in the requirements process, making it simple, maybe reducing players involved in the acquisition process or, at least, making them accountable for the role that they do play.

There has also been talk about a national security space strategy in recent years, and that is very big because that does not exist right now in the way it should be. And there you can really lay out where are we going to go for space, not just for DOD but for the Intelligence Community for now. So, where are we going to go and why? What is the priority? How are we going to get there? And then you can even lay out the thrust areas that you want for S&T and pocket places for the inventions.

This is things that we need to make room for, the next GPS that we don't think we are going to have today. But I really believe we can get there. It is not hopeless, because we were there at one time. And maybe it is just time to go back and look at what made things work back then and try to get back there. There is a lot of people I know in that community who were there back then who would love to get back there today.

Mr. THORNBERRY. Thank you.

Ms. TAUSCHER. Thank you, Mr. Thornberry.

I want to thank our witnesses for their testimony, for their hard work and the people behind them that have worked hard with them. Thank you for your patriotism. Thank you for being here with us.

We obviously have a number of challenges coming forward. Certainly I have heard from my colleagues, ITAR and this whole question of R&D and how we get a better commitment to have deliverables that come on time and on budget and that are part of a suite of systems that maintain our industrial base.

So I think this was a very, very good hearing. I am sorry the votes have come in the middle of it, but I think we have done a good job of making sure that these issues are out in front of us.

So, once again, I thank you for your support and your testimony; and the hearing is adjourned.

[Whereupon, at 2:20 p.m., the subcommittee was adjourned.]

A P P E N D I X

APRIL 30, 2009

PREPARED STATEMENTS SUBMITTED FOR THE RECORD

APRIL 30, 2009

TESTIMONY

OF

JOSH HARTMAN

SENIOR ADVISOR

TO THE

UNDER SECRETARY OF DEFENSE

(ACQUISITION, TECHNOLOGY & LOGISTICS)

BEFORE

THE UNITED STATES HOUSE OF REPRESENTATIVES

ARMED SERVICES STRATEGIC FORCES SUBCOMMITTEE

April 30, 2009

Chairwoman Tauscher, Ranking Member Turner, and distinguished members of the subcommittee, it is both a pleasure and an honor to come back to the committee where I started my career on Capitol Hill. Thank you for the privilege of appearing before you today to discuss the state of space acquisition and the space industrial base.

We live in an increasingly complex world. The demands vary widely, so we need systems that enable speed and agility; these systems must ensure our Nation has response options today and for the future.

Past performance in the development of space and intelligence systems has not given us great confidence in meeting our future challenges in a timely or affordable manner. Today, in multiple mission areas we rely on systems that have lived long past their design lives. For tomorrow, we hope that systems designed with a Cold War mentality will be successfully delivered and able to meet the threats of the future environment.

Across the Department and as recently as the Secretary of Defense's public comments on the budget soon to come to the Congress, we recognize that in the past we have not been buying the right things or buying them in the right manner. However we have several initiatives underway to address this.

I would like to highlight some specific efforts that we are implementing that capture this philosophy and are fundamental to transforming the acquisition process and workforce. They are:

1) Program Manager Empowerment and Accountability

Program managers play a critical role in developing and fielding weapon systems. We have put in place a comprehensive strategy to improve the performance of program managers. Key to this are program manager tenure agreements for ACAT I and II programs. It is the expectation that tenure agreements should correspond to major milestones and last approximately 4 years. Another fundamental piece is Program Management Agreements—a contract between the program manager and the acquisition and requirements/resource officials—to ensure a common basis for understanding and accountability; that plans are fully resourced and realistically achievable; and that effective transparent communication takes place throughout the acquisition process.

2) Configuration Steering Boards (CSBs)

For all major defense programs including space, we have directed the establishment of CSBs. This provides the program manager a forum for socializing changes that are affordable and executable. Boards will be in place for every current and future ACAT I program prior to reaching Milestone (MS) B or its succeeding MS for those that have already received MSB approval. In the CSB, stakeholders will review all requirement changes and any significant technical configuration changes which potentially could result in cost and schedule changes. Boards are empowered to reject any changes and are expected to only approve those where the change is deemed critical, funds are identified, and schedule impacts are truly mitigated. We require every acquisition team member to fully engage the Planning, Programming, Budgeting, and Execution (PPBE) process, thus creating an avenue for program managers to ensure their

programs are either funded to execute their responsibilities or alternatively descoped to match reduced budget levels.

3) Defense Support Teams (DSTs) and Joint Assessment Teams (JATs)

To address the challenge of acquisition execution and assist both industry and Government program managers, we have expanded the use of these teams who consist of outside world-class technical experts and enterprise stakeholders to address our toughest programmatic, technical, architectural, and planning issues. We expect the teams to identify and resolve emergent problems and help the Department successfully execute difficult programs before problems develop while moving the community towards a common vision. DSTs have been successfully employed on the Space Based Infra-Red (SBIR) program to solve its flight software issues. JATs, used more widely in the space community, have been key in establishing an Infra-Red Roadmap for the space segment as well as the Tasking, Processing, Exploitation and Dissemination segment, developing an agreement on the Nation's Next Generation Electro-optical (NGEO) program, addressing Launch range and infrastructure issues, and managing the sensors acquisition and Tri-Agency relationship within the National Polar Orbiting Environmental Satellite System (NPOESS).

4) Prototyping and Competition

We have issued policy requiring competitive, technically mature prototyping. This is designed to rectify problems of inadequate technology maturity and lack of understanding of the critical program development path. Prototyping employed at the level that provides the best value to the taxpayer, component, subsystem, or system level.

In the space community this has been implemented in the Third Generation IR (3GIR) program, where we are scheduled to launch a quarter-earth demonstration on a hosted payload in May 2010, and full-earth competitive demonstrations in fiscal years 2012 and 2013.

5) Principle-based Acquisition

Similar to the blocking and tackling of football, through analysis we are capturing the fundamentals of space acquisition. From these fundamentals, we plan to institute a principle-based acquisition approach that maintains the flexibility necessary for specific systems, but ensures the fundamentals are in place from the very inception of a space or intelligence program. In our analysis to date, we have developed a preliminary list of those fundamentals and intend to integrate them into the space enclosure of 5000.02, Defense Acquisition Policy for application to space and intelligence systems. They include:

- Proper and Linked Acquisition Strategy, Contracting Strategy, and Incentive Strategy
- Stable Requirements
- Robust Systems Engineering Plan and Process
- Sufficient Analysis of Alternatives
- Complete Analysis of Cost Drivers and Major Trade-offs
- Independent Cost Estimate
- Proper Risk Management Strategy
- Support planning (e.g. training, logistics, and operations)

- Comprehensive Interface Definitions
- Effective Testing Approach
- Useful and Effective Integrated Master Schedule
- Proper and Competent Staffing
- Accurate and standardized Contractor Performance Measurement System

State of Space Acquisition and the Industrial Base

In your invitation to testify before the committee, you asked for me to specifically address the state of acquisition and the space industrial base

My assessment of the current execution of major systems acquisitions is that it requires continued improvement to serve the nation properly. In Space and Intelligence, there are mission areas where, as a whole, we can point to increasing levels of success and stability: Communications, Signals Intelligence (SIGINT), and Launch. However, these successes are overshadowed by a collection of overruns and schedule delays in Electro Optical (EO), Radar, Infrared (IR), weather, Precision Navigation and Timing, and Space Situational Awareness. Figure 1 shows the collective success of Air Force, Navy, National Reconnaissance Office, and Tri-Agency efforts. The results of these programs have been a delay of critical capabilities to intelligence customers and warfighters engaged in today's and tomorrow's conflicts.

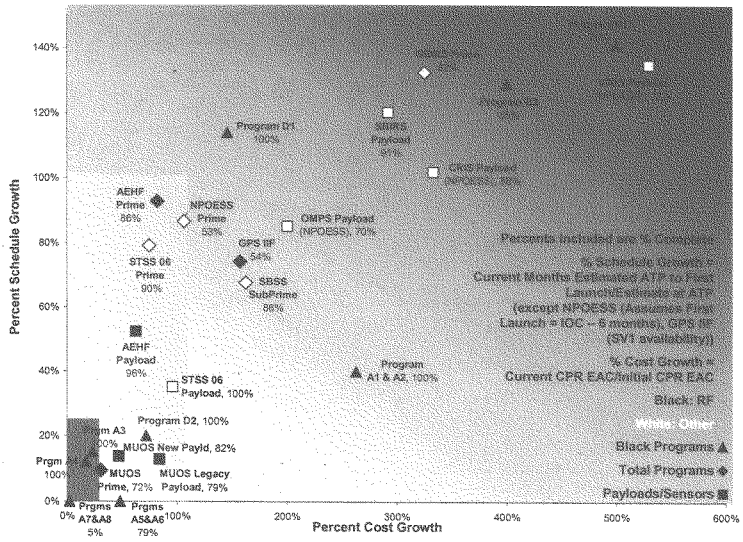


Figure 1. Recent Space and Intelligence Acquisition Performance

The Problems We Face

I believe the key acquisition problems facing the community can be summed up in two words: Accountability and Discipline. For almost two decades, we have lacked accountability and discipline in our acquisition programs.

To paint the picture, I want to quote from the Executive Summary of the OSD CAIG 2008 Space Industrial Base Assessment, "The recent focus on transformational systems has hampered the execution pace required to maintain legacy capabilities. Stability in the workforce and the Department's desires must be achieved. The

Department must re-examine its acquisition strategies to secure continued operational performance from these space domains. Successful programs are those that have realistic cost and schedule expectations, are well understood, have stable budgets, experienced and stable staffs, and have a spiral development acquisition strategy."

In the past, corporate level Office of the Secretary of Defense (OSD) oversight was inadequate or improperly focused. Our Space and Intelligence organizations operated autonomously. Despite the fact that OSD, currently and in the past, held Milestone Decision Authority (MDA) for all air, maritime, and ground Major Defense Acquisition Programs (MDAP), MDA for Space MDAPs has historically been delegated to the Air Force and the National Reconnaissance Office for Space and Intelligence programs. Additionally, non-acquisition personnel performed oversight on these programs. In the absence of accountable oversight, accountability was lost, creative practices stagnated, and discipline in the process disappeared.

To address this, OSD created an organization of certified space acquisition professionals within the Office of the Under Secretary of Defense for Acquisitions Technology and Logistics, called the Space and Intelligence Capabilities Office. This organization has established the previously absent necessary and proper checks and balances between capability advocates, requirements generators, and resource providers, resulting in much needed leadership within the community.

Over the last two decades, the critical skills of personnel in the areas of program management and engineering have atrophied. This can be attributed to training

deficiency, leadership shortfall, and unstable investment in the space industrial base. Today, the Space and Intelligence community face challenges with an aging workforce and low recruitment, resulting in inadequate junior and middle management for the future, as represented in Figure 2. Our programs need technically smart people and accountable, disciplined leaders who can execute them properly. Stable funding in the industrial base, grass roots technical education efforts, and changes to the space community that will make it a more enticing place to work will be necessary for any recovery.

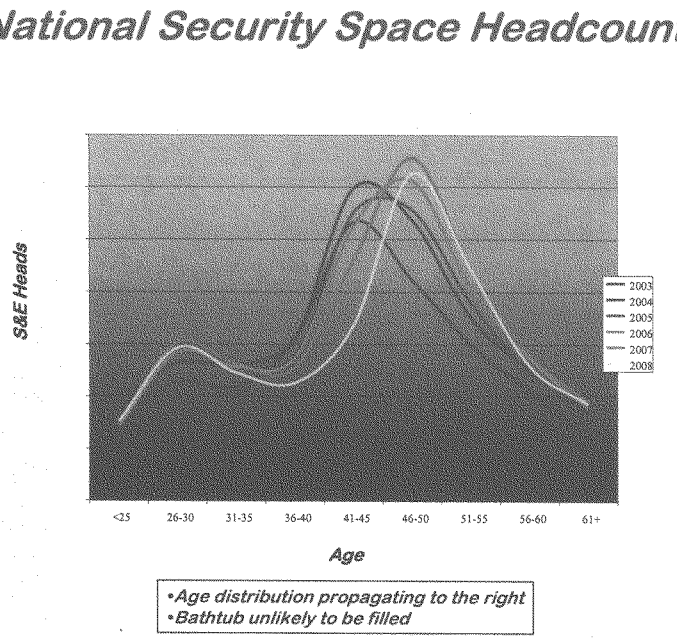


Figure 2. Age Distribution of Space Industry Manpower

Our most daunting problem is that across the Space and Intelligence community we have asked the industrial base to do things that are unwise, inefficient, and often physically impossible. We have attempted to buy large monolithic systems that produce a capability that is one size fits all, i.e. a single system that satisfies all customers, without evaluating the full set of alternatives. The philosophy of a "one-size-fits-all" is what has driven much of our acquisition strategies since 1970. Figure 3 indicates the move from multiple low cost systems to large mega-sensor acquisitions that have only become more complex and more unaffordable.

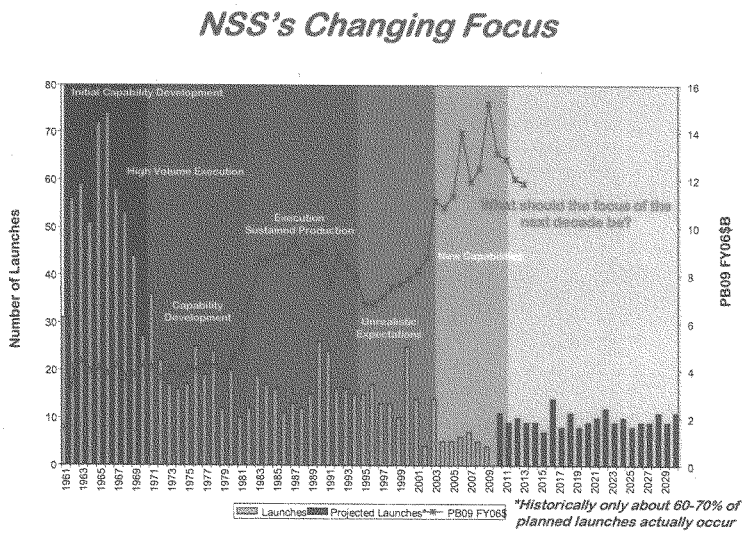


Figure 3. DoD Shift to Fewer and Costlier Space Systems

This model is a Cold War relic, when space systems were needed to satisfy only the strategic policy decision maker and events unfolded in a fairly static timeline. Today's reality is that one size does not fit all. We need to evaluate alternatives to the large complex systems, and use less complex systems when we can do so without compromising the missions our satellites need to perform. Our needs neither can, nor should they be satisfied from one orbit with single mega-sensor acquisition model. There are three main reasons for this.

First, instability in government demand caused by the mega-sensor model has evaporated much of the skills and workforce to meet National Security demands. Additionally, our business practices have provided insufficient volume for sub-tier component and technology providers to remain viable or stimulate benefits from innovation or competition.

Second, different users require different amounts and types of data at different times, from different sensors. Users in SOUTHCOM might require foliage penetrating radar or EO while that capability will largely go unused by CENTCOM. PACOM needs open ocean surveillance of ship tracking, while EUCOM might need to understand the pattern of low-level IR events. The operational tempos in all of the Areas of Responsibility (AOR) diverge greatly and require different timeliness of access, volume, or fidelity. Developing a system that can satisfy all users all of the time is unsustainable if not impossible.

Third, we must begin to consider the implications of a contested environment in space. There is no debate that protection, dissuasion, and deterrence must be a part of our National Security Space Strategy. Deploying architectures with constellations of just a few satellites leave the nation incredibly vulnerable and invites our adversaries to target our systems. The bang for the buck is too great for them to pass up. Survivability must be a consideration in our acquisition processes and our current acquisition model only reinforces this vulnerability.

The Solution

The solution is a change in our business model that will enable employment of an architecture distributed to multiple nodes and layered to provide right level of capability to the right geographic regions at the right times, while leveraging commercial systems and multiple sensors from different sizes of space craft and non-space platforms.

This model would provide for a balanced architecture where a foundational capability would be provided from medium or large systems. At the same time, small and agile, less complex systems would be "layered" to augment in optimized orbits, with additional capability in high demand areas, and niche capability for special operations, irregular needs or crisis situations. As recommended by the GAO, evolution of capability would be a hallmark and key tenet of this model. Systems would purposely be designed to live shorter lives to reduce the system complexity, synchronize on-orbit life with development time, increase industry volume, and take advantage of rapidly advancing technology.

The Effects

This new business model would have multiple beneficial effects on the industrial base, the government workforce, and the capability of our warfighters. First, it would shorten cycle times allowing quicker fielding of assets, larger volume purchases, greater technology refresh rate, and a more stable workforce flow due to the synchronization of development time and mean mission duration—this synchronization may be the most important effect and should not be lost in our discussion on its impact to the industrial base. Second, this new model would reduce overall program risk, raise confidence of delivery, and generate efficiencies that our current system does not produce. Third, due to shorter development schedules, it would create a continuity of expertise and a sense of ownership of individual systems thereby increasing morale and the attractiveness of the space field not experienced today by government or industry personnel. Fourth, the model would restructure competition and reinvigorate innovation through focus on new payload and sub-system developments. Last, it would architect survivability of space assets by design, making it more difficult and costly for and adversary to negate our space capability.

I believe all of these changes can be appropriately introduced and produce the desired results. However, many of the problems I talked about are enmeshed in our culture and this culture must change to see lasting effects. Congress can play has a significant role in helping the administration reinforce that cultural change. I look forward to working with you toward that end and answering any questions you might have today.

United States Government Accountability Office

GAO

Testimony

Before the Subcommittee on Strategic Forces, Committee on Armed Services, House of Representatives

For Release on Delivery
Expected at 1:00 p.m. EDT
Thursday, April 30, 2009

SPACE ACQUISITIONS

Government and Industry Partners Face Substantial Challenges in Developing New DOD Space Systems

Statement of Cristina Chaplain, Director
Acquisition and Sourcing Management

GAO-09-648T

GAO
Accountability · Integrity · Reliability

Highlights

Highlights of GAO-09-648T, a testimony before the Subcommittee on Strategic Forces, Committee on Armed Services, House of Representatives

Why GAO Did This Study

Despite a growing investment in space, the majority of large-scale acquisition programs in the Department of Defense's (DOD) space portfolio have experienced problems during the past two decades that have driven up cost and schedules and increased technical risks. The cost resulting from acquisition problems along with the ambitious nature of space programs have resulted in cancellations of programs that were expected to require investments of tens of billions of dollars. Along with the cost increases, many programs are experiencing significant schedule delays—as much as 7 years—resulting in potential capability gaps in areas such as positioning, navigation, and timing; missile warning; and weather monitoring.

This testimony focuses on

- the condition of space acquisitions,
- causal factors,
- observations on the space industrial base, and
- recommendations for better positioning programs and industry for success.

In preparing this testimony, GAO relied on its body of work in space and other programs, including previously issued GAO reports on assessments of individual space programs, common problems affecting space system acquisitions, and DOD's acquisition policies.

View GAO-09-648T or key components. For more information, contact Cristina Chaplain at (202) 512-4841 or chaplainc@gao.gov.

April 30, 2009

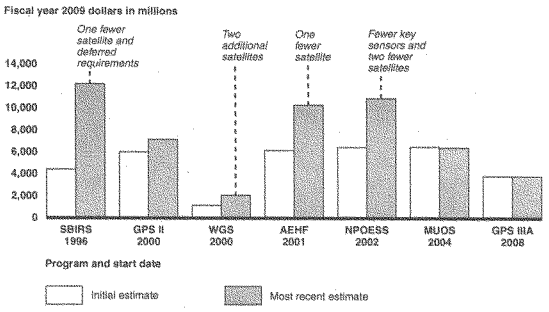
SPACE ACQUISITIONS

Government and Industry Partners Face Substantial Challenges in Developing New DOD Space Systems

What GAO Found

Estimated costs for major space acquisition programs have increased by about $10.9 billion from initial estimates for fiscal years 2008 through 2013. As seen in the figure below, in several cases, DOD has had to cut back on quantity and capability in the face of escalating costs.

Total Cost Differences from Program Start to Most Recent Estimates



Source: GAO analysis of DOD data.

Legend: SBIRS = Space Based Infrared System, GPS = Global Positioning System, WGS = Wideband Global SATCOM, AEHF = Advanced Extremely High Frequency, NPOESS = National Polar-orbiting Operational Environmental Satellite System, and MUOS = Mobile User Objective System.

Several causes behind the cost growth and related problems consistently stand out. First, DOD starts more weapon programs than it can afford, creating a competition for funding that encourages, among other things, low cost estimating and optimistic scheduling. Second, DOD has tended to start its space programs before it has the assurance that the capabilities it is pursuing can be achieved within available resources.

GAO and others have identified a number of pressures associated with the contractors that develop space systems for the government that have hampered the acquisition process, including ambitious requirements, the impact of industry consolidation, and shortages of technical expertise in the workforce. Although DOD has taken a number of actions to address the problems on which GAO has reported, additional leadership and support are still needed to ensure that reforms that DOD has begun will take hold.

Madam Chairman and Members of the Subcommittee:

I am pleased to be here today to discuss the Department of Defense's (DOD) space acquisitions and the space industrial base. The topic of today's hearing is critically important. Despite a growing investment in space, the majority of large-scale acquisition programs in DOD's space portfolio have experienced problems during the past two decades that have driven up cost and schedules and increased technical risks. The cost resulting from acquisition problems along with the ambitious nature of space programs has resulted in cancellations of programs that were expected to require investments of tens of billions of dollars, including the recently proposed cancellation of the Transformational Satellite Communications System (TSAT). Moreover, along with the cost increases, many programs are experiencing significant schedule delays—as much as 7 years—resulting in potential capability gaps in areas such as positioning, navigation, and timing; missile warning; and weather monitoring.

My testimony today will focus on the condition of space acquisitions, causal factors, observations on the space industrial base, and recommendations for better positioning programs and industry for success. Many of these have been echoed by the Allard Commission,[1] which studied space issues in response to a requirement in the John Warner National Defense Authorization Act for Fiscal Year 2007, and by a study by the House Permanent Select Committee on Intelligence (HPSCI),[2] among other groups. The two studies also highlighted concerns about diffuse leadership for military and intelligence space efforts, declining numbers of space engineering and technical professionals, and weaknesses in the space industrial base. Members of the Allard Commission were unanimous in their conviction that without significant improvements in the leadership and management of national security space programs, U.S. space preeminence will erode "to the extent that space ceases to provide a competitive national security advantage." The HPSCI reached very similar conclusions, adding that "a once robust partnership between the U.S. government and the American space industry has been weakened by years of demanding space programs, the

[1]Institute for Defense Analyses, *Leadership, Management, and Organization for National Security Space: Report to Congress of the Independent Assessment Panel on the Organization and Management of National Security Space* (Alexandria, VA.: July 2008).

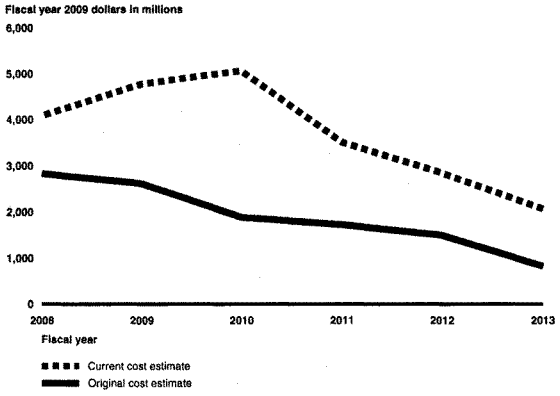
[2]House Permanent Select Committee on Intelligence, *Report on Challenges and Recommendations for United States Overhead Architecture* (Washington, D.C.: October 2008).

exponential complexity of technology, and an inattention to acquisition discipline."

Space Acquisition Problems Persist

Figure 1 compares original cost estimates and current cost estimates for the broader portfolio of major space acquisitions for fiscal years 2008 through 2013. The wider the gap between original and current estimates, the fewer dollars DOD has available to invest in new programs. As shown in the figure, estimated costs for the major space acquisition programs have increased by about $10.9 billion from initial estimates for fiscal years 2008 through 2013. The declining investment in the later years is the result of the Evolved Expendable Launch Vehicle (EELV) program no longer being considered a major acquisition program and the cancellation and proposed cancellation of two development efforts which would have significantly increased DOD's major space acquisition investment.

Figure 1: Comparison between Original Cost Estimates and Current Cost Estimates for Selected Major Space Acquisition Programs for Fiscal Years 2008 through 2013

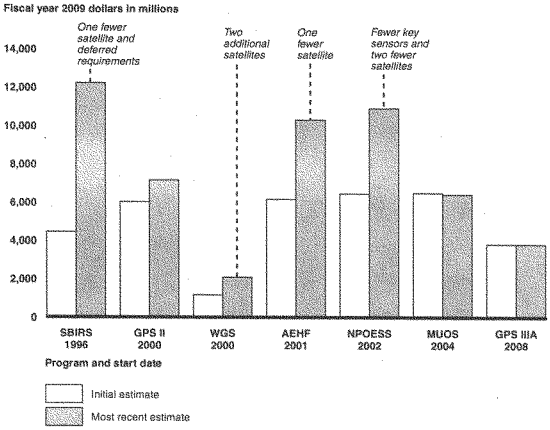


Source: GAO analysis of DOD data.

Note: The acquisition programs include Advanced Extremely High Frequency, Global Broadcast Service, Global Positioning System II, Global Positioning System IIIA, Mobile User Objective System, National Polar-orbiting Operational Environmental Satellite System, Space Based Infrared System, and Wideband Global SATCOM.

Figures 2 and 3 reflect differences in total life-cycle costs and unit costs for satellites from the time the programs officially began to their most recent cost estimate. As figure 3 notes, in several cases, DOD has had to cut back on quantity and capability in the face of escalating costs. For example, two satellites and four instruments were deleted from National Polar-orbiting Operational Environmental Satellite System (NPOESS) and four sensors are expected to have fewer capabilities. This will reduce some planned capabilities for NPOESS as well as planned coverage.

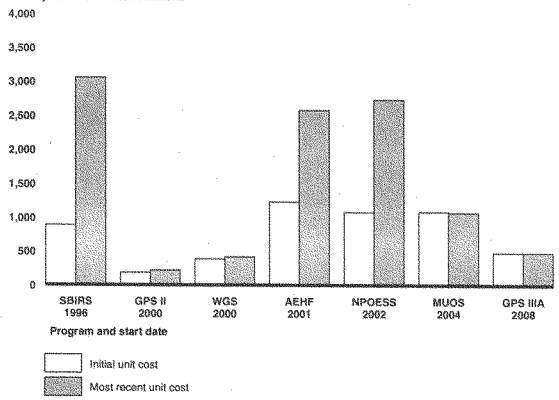
Figure 2: Differences in Total Life-Cycle Program Costs from Program Start and Most Recent Estimates



Source: GAO analysis of DOD data.

Legend: SBIRS = Space Based Infrared System, GPS = Global Positioning System, WGS = Wideband Global SATCOM, AEHF = Advanced Extremely High Frequency, NPOESS = National Polar-orbiting Operational Environmental Satellite System, and MUOS = Mobile User Objective System.

Figure 3: Differences in Unit Costs from Program Start to Most Recent Estimates

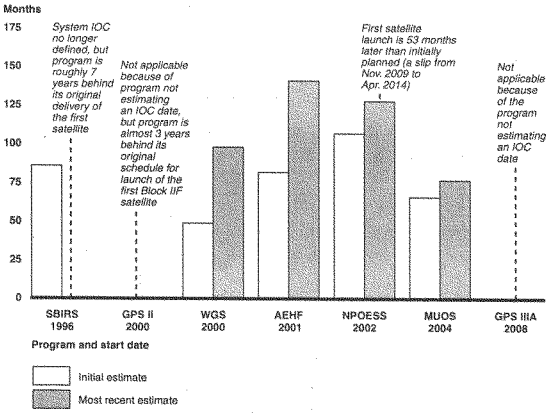


Source: GAO analysis of DOD data.

Legend: SBIRS = Space Based Infrared System, GPS = Global Positioning System, WGS = Wideband Global SATCOM, AEHF = Advanced Extremely High Frequency, NPOESS = National Polar-orbiting Operational Environmental Satellite System, and MUOS = Mobile User Objective System.

Figure 4 highlights the additional estimated months needed to complete programs. These additional months represent time not anticipated at the programs' start dates. Generally, the further schedules slip, the more DOD is at risk of not sustaining current capabilities. For this reason, DOD began a follow-on system effort, known as the Third Generation Infrared Satellite to run in parallel with the Space Based Infrared System (SBIRS) program.

Figure 4: Differences in Total Number of Months to Initial Operational Capability (IOC) from Program Start and Most Recent Estimates



Source: GAO analysis of DOD data.

Legend: SBIRS = Space Based Infrared System, GPS = Global Positioning System, WGS = Wideband Global SATCOM, AEHF = Advanced Extremely High Frequency, NPOESS = National Polar-orbiting Operational Environmental Satellite System, and MUOS = Mobile User Objective System.

This fiscal year, DOD launched the second Wideband Global SATCOM (WGS) satellite. WGS had previously been experiencing technical and other problems, including improperly installed fasteners and data transmission errors. When DOD finally resolved these issues, it significantly advanced capability available to warfighters. Additionally, the EELV program had its 23rd consecutive successful operational launch earlier this month. However, other major space programs have had setbacks. For example:

- In September 2008, the Air Force reported a Nunn-McCurdy unit cost breach of the critical cost growth threshold[3] for the Advanced Extremely High Frequency (AEHF) satellite because of cost growth brought on by technical issues, schedule delays, and increased costs for the procurement of a fourth AEHF satellite. The launch of the first satellite has slipped further by almost 2 years from November 2008 to as late as September 2010. Further, the program office estimates that the fourth AEHF satellite could cost more than twice the third satellite because some components that are no longer manufactured will have to be replaced and production will have to be restarted after a 4-year gap. Because of these delays, initial operational capability has slipped 3 years—from 2010 to 2013.

- The Mobile User Objective System (MUOS) communications satellite estimates an 11-month delay—from March 2010 to February 2011—in the delivery of on-orbit capability from the first satellite. Further, contractor costs for the space segment have increased about 48 percent because of the additional labor required to address issues related to satellite design complexity, satellite weight, and satellite component test anomalies and associated rework. Despite the contractor cost increases, the program has been able to remain within its baseline program cost estimate.

- The Global Positioning System (GPS) IIF satellite is now expected to be delayed almost 3 years from its original date to November 2009. Also, the cost of GPS IIF is now expected to be about $1.6 billion—about $870 million over the original cost estimate of $729 million. (This approximately 119 percent cost increase is not that noticeable in figures 2 and 3 because the GPS II modernization program includes the development and procurement of 33 satellites, only 12 of which are IIF satellites.) The Air Force has had difficulty in the past building GPS satellites within cost and schedule goals because of significant technical problems, which still threaten its delivery schedule and challenges it faced with a different contractor for the IIF program, which did not possess the same expertise as the previous GPS contractor. Further, while the Air Force is structuring

[3]The Nunn-McCurdy provision (10 U.S.C. § 2433) currently requires DOD to take specific actions when a major defense acquisition program's growth exceeds certain cost thresholds. Some of the key provisions of the law require, for example, that for major defense acquisition programs, (1) Congress must be notified when a program has an increase of at least 15 percent in program acquisition unit cost above the unit cost in the current baseline estimate and (2) the Secretary of Defense must certify the program to Congress when the program has unit cost increases of at least 25 percent of the current baseline estimate or at least 50 percent of the original baseline estimate. 10 U.S.C. § 2433(a)(4)(5);(d)(3);(e)(4). The current law also includes cost growth thresholds from the program's original baseline estimate. 10 U.S.C. § 2433(a)(4)(5).

the new GPS IIIA program to prevent mistakes made on the IIF program, the Air Force is aiming to deploy the GPS IIIA satellites 3 years faster than the IIF satellites. We believe the IIIA schedule is optimistic given the program's late start, past trends in space acquisitions, and challenges facing the new contractor.

- Total program cost for the SBIRS program is estimated around $12.2 billion, an increase of $7.5 billion over the original program cost, which included 5 geosynchronous earth orbit (GEO) satellites. The first GEO satellite has been delayed roughly 7 years in part because of poor oversight, technical complexities, and rework. Although the program office set December 2009 as the new launch goal for the satellite, a recent assessment by the Defense Contract Management Agency anticipates an August 2010 launch date, adding an additional 8 months to the previous launch estimate. Subsequent GEO satellites have also slipped as a result of the flight software design issues.

- The NPOESS program has experienced problems with replenishing its aging constellation of satellites and was restructured in July 2007 in response to a Nunn-McCurdy unit cost breach of the critical cost growth threshold. The program was originally estimated to cost about $6.5 billion for six satellites from 1995 through 2018. The restructured program called for reducing the number of satellites from six to four and included an overall increase in program costs, delays in satellite launches, and deletions or replacements of satellite sensors. Although the number of satellites has been reduced, total costs have increased by almost 108 percent since program start. Specifically, the current estimated life cycle cost of the restructured program is now about $13.5 billion for four satellites through 2026. This amount is higher than what is reflected in figure 2 as it represents the most recent GAO estimate as opposed to the DOD estimates used in the figure. We reported last year that poor workmanship and testing delays caused an 8-month slip in the delivery of a complex imaging sensor. This late delivery caused a delay in the expected launch date of a demonstration satellite, moving it from late September 2009 to early January 2011.

  This year it is also becoming more apparent that space acquisition problems are leading to potential gaps in the delivery of critical capabilities. For example, DOD faces a potential gap in protected military communications caused by delays in the AEHF program and the proposed cancellation of the TSAT program, which itself posed risks in schedule delays because of TSAT's complexity and funding cuts designed to ensure technology objectives were achievable. DOD faces a potential gap in ultra high frequency (UHF) communications capability caused by the

unexpected failures of two satellites already in orbit and the delays resulting from the MUOS program. DOD also faces potential gaps or decreases in positioning, navigation and timing capabilities because of late delivery of the GPS IIF satellites and the late start of the GPS IIIA program. There are also concerns about potential gaps in missile warning and weather monitoring capabilities because of delays in SBIRS and NPOESS.

Addressing gaps in any one of these areas is not a simple matter. While there may be opportunities to build less complex "gap filler" satellites, for example, these still require time and money that may not be readily available because of commitments to the longer-term programs. There may also be opportunities to continue production of "older" generation satellites, but such efforts also require time and money that may not be readily available and may face other challenges such as restarting production lines and addressing issues related to obsolete parts and materials. Further, satellites on orbit can be made to last longer by turning power off at certain points in time, but this may also present unacceptable tradeoffs in capability.

Underlying Reasons for Cost and Schedule Growth

Our past work has identified a number of causes behind the cost growth and related problems, but several consistently stand out. First, on a broad scale, DOD starts more weapon programs than it can afford, creating a competition for funding that encourages low cost estimating, optimistic scheduling, overpromising, suppressing of bad news, and, for space programs, forsaking the opportunity to identify and assess potentially more executable alternatives. Programs focus on advocacy at the expense of realism and sound management. Invariably, with too many programs in its portfolio, DOD is forced to continually shift funds to and from programs—particularly as programs experience problems that require additional time and money to address. Such shifts, in turn, have had costly, reverberating effects.

Second, DOD has tended to start its space programs too early, that is, before it has the assurance that the capabilities it is pursuing can be achieved within available resources and time constraints. This tendency is caused largely by the funding process, since acquisition programs attract more dollars than efforts concentrating solely on proving technologies. Nevertheless, when DOD chooses to extend technology invention into acquisition, programs experience technical problems that require large amounts of time and money to fix. Moreover, when this approach is followed, cost estimators are not well positioned to develop accurate cost estimates because there are too many unknowns. Put more simply, there is

no way to accurately estimate how long it would take to design, develop, and build a satellite system when critical technologies planned for that system are still in relatively early stages of discovery and invention.

While our work has consistently found that maturing technologies before program start is a critical enabler of success, it is important to keep in mind that this is not the only solution. Both the TSAT and the Space Radar development efforts, for example, were seeking to mature critical technologies before program start, but they faced other risks related to the systems' complexity, affordability, and other development challenges. Ultimately, Space Radar was cancelled and DOD has proposed the cancellation of TSAT. Last year, we cited the MUOS program's attempts to mature critical technologies before program start as a best practice, but the program has since encountered technical problems related to design issues and test anomalies.

Third, programs have historically attempted to satisfy all requirements in a single step, regardless of the design challenge or the maturity of the technologies necessary to achieve the full capability. DOD has preferred to make fewer but heavier, larger, and more complex satellites that perform a multitude of missions rather than larger constellations of smaller, less complex satellites that gradually increase in sophistication. This has stretched technology challenges beyond current capabilities in some cases and vastly increased the complexities related to software. Programs also seek to maximize capability because it is expensive to launch satellites. A launch using a medium- or intermediate-lift evolved expendable launch vehicle, for example, would cost roughly $65 million.

Fourth, several of today's high-risk space programs began in the late 1990s, when DOD structured contracts in a way that reduced government oversight and shifted key decision-making responsibility onto contractors. This approach—known as Total System Performance Responsibility, or TSPR—was intended to facilitate acquisition reform and enable DOD to streamline its acquisition process and leverage innovation and management expertise from the private sector. Specifically, TSPR gave a contractor total responsibility for the integration of an entire weapon system and for meeting DOD's requirements. However, because this reform made the contractor responsible for day-to-day program management, DOD did not require formal deliverable documents—such as earned value management reports—to assess the status and performance of the contractor. The resulting erosion of DOD's capability to lead and manage the space acquisition process magnified problems related to requirements creep and poor contractor performance. Further, the

reduction in government oversight and involvement led to major reductions in various government capabilities, including cost-estimating and systems-engineering staff. The loss of cost-estimating and systems-engineering staff in turn led to a lack of technical data needed to develop sound cost estimates.

Observations on the Space Industrial Base

We have not performed a comprehensive review of the space industrial base, but our prior work has identified a number of pressures associated with contractors that develop space systems for the government that have hampered the acquisition process. Many of these have been echoed in other studies conducted by DOD and congressionally chartered commissions.

We and others have reported that industry—including both prime contractors and subcontractors—has been consolidated to a point where there may be only one company that can develop a needed capability or a specific component for a satellite system.[4] In the view of DOD and industry officials we have interviewed, this condition has enabled contractors to hold some programs hostage and has made it difficult to inject competition into space programs. We also have identified cases where space programs experienced unanticipated problems resulting from consolidations in the supplier base. For example, contractors took cost-cutting measures that reduced the quality of parts. In the case of GPS IIF, contractors lost key technical personnel as they consolidated development and manufacturing facilities, causing inefficiencies in the program.

In addition, space contractors are facing workforce pressures similar to those experienced by the government, that is, there is not enough technical expertise to develop highly complex space systems. A number of studies have found that both industry and the U.S. government face substantial shortages of scientists and engineers and that recruitment of new personnel is difficult because the space industry is one of many sectors competing for the limited number of trained scientists and engineers. Security clearance requirements make competing for talented personnel even more difficult for military and intelligence space programs as opposed to civil space programs.

[4]GAO, *Defense Acquisitions: Incentives and Pressures That Drive Problems Affecting Satellite and Related Acquisitions*. GAO-05-570R (Washington, D.C.: June 23, 2005).

In a 2006 review of space cost estimating, we also found that the government has made erroneous assumptions about the space industrial base when it started the programs that are experiencing the most challenges today.[5] In a review for this subcommittee, for instance, we found that the original contracting concept for the EELV program was for the Air Force to piggyback on the anticipated launch demand of the commercial sector. Furthermore, the Air Force assumed that it would benefit financially from competition among commercial vendors. However, the commercial demand never materialized, and the government decided to bear the cost burden of maintaining the industrial base in order to maintain launch capability, and assumed savings from competition were never realized.

Actions Needed to Address Space and Weapon Acquisition Problems

Over the past decade, we have identified best practices that DOD space programs can benefit from. DOD has taken a number of actions to address the problems on which we have reported. These include initiatives at the department level that will affect its major weapons programs, as well as changes in course within specific Air Force programs. Although these actions are a step in the right direction, additional leadership and support are still needed to ensure that reforms that DOD has begun will take hold.

Our work—which is largely based on best practices in the commercial sector—has recommended numerous actions that can be taken to address the problems we identified. Generally, we have recommended that DOD separate technology discovery from acquisition, follow an incremental path toward meeting user needs, match resources and requirements at program start, and use quantifiable data and demonstrable knowledge to make decisions to move to next phases. We have also identified practices related to cost estimating, program manager tenure, quality assurance, technology transition, and an array of other aspects of acquisition program management that space programs could benefit from. Table 1 highlights these practices.

[5]GAO, *Space Acquisitions: DOD Needs to Take More Action to Address Unrealistic Initial Cost Estimates of Space Systems*. GAO-07-96 (Washington, D.C.: Nov. 17, 2006).

Table 1: Actions Needed to Address Space and Weapon Acquisition Problems

Before undertaking new programs
• Prioritize investments so that projects can be fully funded and it is clear where projects stand in relation to the overall portfolio.
• Follow an evolutionary path toward meeting mission needs rather than attempting to satisfy all needs in a single step.
• Match requirements to resources—that is, time, money, technology, and people—before undertaking a new development effort.
• Research and define requirements before programs are started and limit changes after they are started.
• Ensure that cost estimates are complete, accurate, and updated regularly.
• Commit to fully fund projects before they begin.
• Ensure that critical technologies are proven to work as intended before programs are started.
• Assign more ambitious technology development efforts to research departments until they are ready to be added to future generations (increments) of a product.
• Use systems engineering to close gaps between resources and requirements before launching the development process.
During program development
• Use quantifiable data and demonstrable knowledge to make go/no-go decisions, covering critical facets of the program such as cost, schedule, technology readiness, design readiness, production readiness, and relationships with suppliers.
• Do not allow development to proceed until certain thresholds are met—for example, a high proportion of engineering drawings completed or production processes under statistical control.
• Empower program managers to make decisions on the direction of the program and to resolve problems and implement solutions.
• Hold program managers accountable for their choices.
• Require program managers to stay with a project to its end.
• Hold suppliers accountable to deliver high-quality parts for their products through such activities as regular supplier audits and performance evaluations of quality and delivery, among other things.
• Encourage program managers to share bad news, and encourage collaboration and communication.

Source: GAO.

Several of these practices could also benefit the space industrial base. For instance, applying an evolutionary approach to development would likely provide a steadier pipeline of government orders and thus enable suppliers to maintain their expertise and production lines. More realistic cost estimating and full funding would reduce funding instability, which could reduce fits and starts that create planning difficulties for suppliers. Longer tenure and more authority for program managers would provide more continuity in relationships between the government and its suppliers.

DOD is attempting to implement some of these practices for its major weapon programs. For example, as part of its strategy for enhancing the roles of program managers in major weapon system acquisitions, the department has established a policy that requires formal agreements among program managers, their acquisition executives, and the user community that set forth common program goals. These agreements are

intended to be binding and to detail the progress a program is expected to make during the year and the resources the program will be provided to reach these goals. DOD is also requiring program managers to sign tenure agreements so that their tenure will correspond to the next major milestone review closest to 4 years. Over the past few years, DOD has also been testing portfolio management approaches in selected capability areas—command and control, net-centric operations, battlespace awareness, and logistics—to facilitate more strategic choices for resource allocation across programs.

Within the space community, cost estimators from industry and agencies involved in space have been working together to improve the accuracy and quality of their estimates. In addition, on specific programs, actions have been taken to prevent mistakes made in the past. For example, on the GPS IIIA program, the Air Force is using an incremental development approach, where it will gradually meet the needs of its users; using military standards for satellite quality; conducting multiple design reviews; exercising more government oversight and interaction with the contractor and spending more time at the contractor's site; and using an improved risk management process. On the SBIRS program, the Air Force acted to strengthen relationships between the government and the SBIRS contractor team, and to implement more effective software development practices as it sought to address problems related to the systems flight software system. Correspondingly, DOD's Office of the Under Secretary of Defense for Acquisition, Technology, and Logistics is asking space programs passing through milestone reviews to take specific measures to better hold contractors accountable through award and incentive fees, to require independent technology readiness assessments at particular points in the acquisition process, and to hold requirements stable.

Furthermore, the Air Force, U.S. Strategic Command, and other key organizations have made progress in implementing the Operationally Responsive Space (ORS) initiative. This initiative encompasses several separate endeavors with a goal to provide short-term tactical capabilities as well as identifying and implementing long-term technology and design solutions to reduce the cost and time of developing and delivering simpler satellites in greater numbers. ORS provides DOD with an opportunity to work outside the typical acquisition channels to more quickly and less expensively deliver these capabilities. In 2008, we found that DOD has made progress in putting a program management structure in place for ORS as well as executing ORS-related research and development efforts, which include development of low-cost small satellites, common design techniques, and common interfaces.

Legislation introduced in recent years has also focused on improving space and weapon acquisitions. In February, the Senate Committee on Armed Services introduced an acquisition reform bill which contains provisions that could significantly improve DOD's management of space programs. For instance, the bill focuses on increasing emphasis on systems engineering and developmental testing, instituting earlier preliminary design reviews, and strengthening independent cost estimates and technology readiness assessments. Taken together, these measures could instill more discipline in the front end of the acquisition process when it is critical for programs to gain knowledge. The bill also requires greater involvement by the combatant commands in determining requirements and requiring greater consultation between the requirements, budget, and acquisition processes. In addition, several of the bill's sections, as currently drafted, would require in law what DOD policy already calls for, but it is not being implemented consistently in weapon programs. Last week, the House Committee on Armed Services announced it would be introducing a bill to similarly reform DOD's system for acquiring weapons by providing for, among other things, oversight early in product development and for appointment of independent officials to review acquisition programs. However, we did not have time to assess the bill for this statement.

The actions that the Air Force and Office of the Secretary of Defense have been taking to address acquisition problems are good steps. But, there are still more, significant changes to processes, policies, and support needed to ensure reforms can take hold. In particular, several studies have recently concluded that there is a need to strengthen leadership for military and intelligence space efforts. The Allard Commission reported that responsibilities for military space and intelligence programs are scattered across the staffs of the DOD and the Intelligence Community and that it appears that "no one is in charge" of national security space. The HPSCI expressed similar concerns in its report, focusing specifically on difficulties in bringing together decisions that would involve both the Director of National Intelligence and the Secretary of Defense. Prior studies, including those conducted by the Defense Science Board and the Commission to Assess United States National Security Space Management and Organization (Space Commission)[6] have identified similar problems, both for space as a whole and for specific programs. While these studies

[6]Department of Defense. *Report of the Commission to Assess United States National Security Space Management and Organization* (Washington, D.C.: Jan. 11, 2001).

have made recommendations for strengthening leadership for space acquisitions, no major changes to the leadership structure have been made in recent years. In fact, an "executive agent" position within the Air Force that was designated in 2001 in response to a Space Commission recommendation to provide leadership has not been filled since the last executive resigned in 2007.

In addition, more actions may be needed to address shortages of personnel in program offices for major space programs. We recently reported that personnel shortages at the EELV program office have occurred particularly in highly specialized areas, such as avionics and launch vehicle groups. Program officials stated that 7 of 12 positions in the engineering branch for the Atlas group were vacant. These engineers work on issues such as reviewing components responsible for navigation and control of the rocket. Moreover, only half the government jobs in some key areas were projected to be filled. These and other shortages in the EELV program office heightened concerns about DOD's ability to use a cost-reimbursement contract acquisition strategy for EELV since that strategy required greater government attention to the contractor's technical, cost, and schedule performance information. In previous reviews, we cited personnel shortages at program offices for TSAT as well as for cost estimators across space. While increased reliance on contractor employees has helped to address workforce shortages, it could ultimately create gaps in areas of expertise that could limit the government's ability to conduct oversight.

Further, while actions are being undertaken to make more realistic cost estimates, programs are still producing schedule estimates that are optimistic and promising that they will not miss their schedule goals. The GPS IIIA program, for example, began 9 months later than originally anticipated because of funding delays, but the delivery date remained the same. The schedule is 3 years shorter than the one achieved so far on GPS IIF. We recognize that the GPS IIIA program has built a more solid foundation for success than the IIF, which offers the best course to deliver on time, but setting an ambitious schedule goal should not be the Air Force's only measure for mitigating potential capability gaps. Last year, we also reported that the SBIRS program's revised schedule estimates for addressing software problems appeared too optimistic. For example, software experts, independent reviewers, as well as the government officials we interviewed agreed that the schedule was aggressive, and the Defense Contract Management Agency has repeatedly highlighted the schedule as high risk.

Concluding Remarks

In conclusion, senior leaders managing DOD's space portfolio are working in a challenging environment. There are pressures to deliver new, transformational capabilities, but problematic older satellite programs continue to cost more than expected, constrain investment dollars, pose risks of capability caps, and thus require more time and attention from senior leaders than well-performing efforts. Moreover, military space is at a critical juncture. While there are concerns about the United States losing its competitive edge in the development of space technology, there are critical capabilities that are at risk of falling behind their current level of service. To best mitigate these circumstances and put future programs on a better path, DOD needs to focus foremost on sustaining current capabilities and preparing for potential gaps. In addition, there is still a looming question of how military and intelligence space activities should be organized and led. From an acquisition perspective, what is important is that the right decisions are made on individual programs, the right capability is in place to manage them, and there is someone to hold accountable when programs go off track.

Madam Chairman, this concludes my prepared statement. I would be happy to answer any questions you or members of the subcommittee may have at this time.

Contacts and Acknowledgments

For further information about this statement, please contact Cristina Chaplain at (202) 512-4841 or chaplainc@gao.gov. Contact points for our Offices of Congressional Relations and Pubic Affairs may be found on the last page of this statement. Individuals who made key contributions to this statement include Art Gallegos, Assistant Director; Greg Campbell; Maria Durant; Arturo Holguin; Laura Holliday; Rich Horiuchi; Sylvia Schatz; and Peter Zwanzig.

Appendix I: Scope and Methodology

In preparing this testimony, we relied on our body of work in space programs, including previously issued GAO reports on assessments of individual space programs, common problems affecting space system acquisitions, and the Department of Defense's (DOD) acquisition policies. We relied on our best practices studies, which comment on the persistent problems affecting space acquisitions, the actions DOD has been taking to address these problems, and what remains to be done. We also relied on work performed in support of our 2009 annual weapons system assessment. The individual reviews were conducted in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

GAO's Mission	The Government Accountability Office, the audit, evaluation, and investigative arm of Congress, exists to support Congress in meeting its constitutional responsibilities and to help improve the performance and accountability of the federal government for the American people. GAO examines the use of public funds; evaluates federal programs and policies; and provides analyses, recommendations, and other assistance to help Congress make informed oversight, policy, and funding decisions. GAO's commitment to good government is reflected in its core values of accountability, integrity, and reliability.
Obtaining Copies of GAO Reports and Testimony	The fastest and easiest way to obtain copies of GAO documents at no cost is through GAO's Web site (www.gao.gov). Each weekday afternoon, GAO posts on its Web site newly released reports, testimony, and correspondence. To have GAO e-mail you a list of newly posted products, go to www.gao.gov and select "E-mail Updates."
Order by Phone	The price of each GAO publication reflects GAO's actual cost of production and distribution and depends on the number of pages in the publication and whether the publication is printed in color or black and white. Pricing and ordering information is posted on GAO's Web site, http://www.gao.gov/ordering.htm. Place orders by calling (202) 512-6000, toll free (866) 801-7077, or TDD (202) 512-2537. Orders may be paid for using American Express, Discover Card, MasterCard, Visa, check, or money order. Call for additional information.
To Report Fraud, Waste, and Abuse in Federal Programs	Contact: Web site: www.gao.gov/fraudnet/fraudnet.htm E-mail: fraudnet@gao.gov Automated answering system: (800) 424-5454 or (202) 512-7470
Congressional Relations	Ralph Dawn, Managing Director, dawnr@gao.gov, (202) 512-4400 U.S. Government Accountability Office, 441 G Street NW, Room 7125 Washington, DC 20548
Public Affairs	Chuck Young, Managing Director, youngc1@gao.gov, (202) 512-4800 U.S. Government Accountability Office, 441 G Street NW, Room 7149 Washington, DC 20548

House Armed Services Committee
Strategic Forces Subcommittee
April 30, 2009

Written testimony by Marion C. Blakey, President and CEO
Aerospace Industries Association

Introduction

Good afternoon Madame Chairman, Ranking Member Turner, and members of the Subcommittee. It is good to have the opportunity to testify before you today on such an important topic as the U.S. national security space industrial base. As the President and Chief Executive Officer of the Aerospace Industries Association (AIA), I represent our nearly 300 aerospace manufacturing companies and the over 650,000 highly-skilled employees, including the over 140,000 who make the satellites, space sensors, spacecraft, launch vehicles, and the ground support systems employed by the Department of Defense, the National Reconnaissance Office, and other civil, military, and intelligence space efforts. I welcome the opportunity to come before you today to talk about the importance of our national security space industrial base, and the challenges we must confront to ensure a healthy and robust domestic space industry.

Importance of Investing in National Security Space Infrastructure

Today's national security space systems are a critical infrastructure that provides the high-technology capabilities that our nation simply cannot afford to do without. The jobs held by the thousands of workers, scientists, and engineers who design and build these systems are just the kind of jobs needed to keep our nation strong and our economy innovative and competitive.

To provide a few examples; electro-optical and other types of imaging satellites allow high-fidelity intelligence on everything from terrorists in the tribal regions of Pakistan, North Korean and Iranian missile programs, to the arms modernization efforts of our strategic competitors. When North Korea or Iran launch a missile, our space systems provide early warning that notifies our national leaders and defense officials, and space and launch technologies play an integral role in intercepting those missiles should they be directed at the U.S. or our allies.

Satellites also provide global, secure communications, and positioning and navigation that are increasingly relied upon by our service members in irregular warfare environments like the hard-to-reach mountains of Afghanistan, and to our sailors and Special Forces off the coasts of Africa where traditional forms of communications are lacking. In addition, satellites provide needed bandwidth that support the rapidly growing numbers of unmanned aerial systems deployed in global irregular conflicts.

And of course, without the launch and associated networks of ground support systems we wouldn't be able to get these satellites into orbit to begin with. Also critical to ensuring our space systems operate effectively are space protection and space situational awareness capabilities deployed by industry and government. As evidenced by the February 2009 collision of a commercial U.S. satellite and Russian satellite, more resources must be provided to the Department of Defense to protect our space assets in an increasingly crowded environment.

To summarize, the capabilities provided by space systems are critical, they support virtually every aspect of our modern military, and in cases such as global positioning, are now relied upon by millions of American civilians. In fact, our nation's economy is tied directly to space technology. Communications drive today's commerce, and space systems are a chief conduit of our nation's communications systems. Our direct-to-home television and satellite radio have become normal in many American homes and automobiles. It's absolutely necessary for us to continue to maintain and upgrade our space infrastructure, adequately protect it, and ensure a healthy space industrial base.

Industrial Base Challenges: Export Barriers

With that said, there are a variety of very serious challenges that are negatively impacting the health of our national security space industrial base. At the forefront of these challenges are the strains created by our nation's export control policies for space technology.

In 2008, AIA participated in the Center for Strategic and International Studies (CSIS) study titled, "The Health of the U.S. Space Industrial Base and the Impact of Export Controls." This important study came about after rising concern within the national security space community regarding the health of the space industrial base and the impact of export controls on the industrial base.

The resulting findings showed that export restrictions have hit our nation's space companies, and especially the space supplier base, particularly hard. According to CSIS, the U.S. dominated the global satellite export market at over 70% of worldwide share in 1995.[1] Three years later, Congress passed a law that moved the export classification of commercial communications satellites to the International Traffic in Arms Regulations (ITAR) regime, which was intended to protect sensitive space technologies and preserve U.S. preeminence in space.

While the intentions of the move might have been good, the results were disastrous. According to the CSIS report, contract awards for commercial communications satellite manufacturing dropped over 20% by 2000, and by 2005 the U.S.'s worldwide share of the global satellite export market stood at a mere 25%. ITAR hasn't slowed down the spread of space technology – today over 70 nations are engaged in space activities. Since

[1] Center for Strategic & International Studies, *Health of the U.S. Space Industrial Base and the Impact of Export Controls*, February 2008

U.S. law was changed, many companies in Europe and elsewhere actually tout their satellites and components as "ITAR-free." Commercial satellites are now the poster child for the need to further modernize the U.S. export control system. Due to ITAR, U.S. firms are forced to navigate an extremely challenging pathway to gain export approval, even to do business with key allies. Even more troublesome is that all parts of a commercial satellite – no matter how innocuous – are restricted and considered munitions list items. This poses challenges to the U.S.'s ability to lead space partnerships with our allies abroad and it is wreaking havoc on our domestic space industrial base.

With outdated and unduly restrictive export control policies preventing the development of a robust commercial base for the U.S. space industry; our nation has in-effect forced the space industry to rely on the U.S. government for its survival. According to CSIS, 60 percent of the industry's revenues are tied to national security, and when civil government space is included nearly 95 percent of the industry's revenues are tied to the U.S. government.[2] This creates a situation in which government plans and policies directly impact the health of the industrial base, as opposed to situation where a modernized export control regime leads to a more innovative and competitive industry.

A recent survey by the National Security Space Office of nearly 200 small U.S. space companies found that 70 percent of those companies surveyed cited ITAR restrictions as inhibiting their ability to compete for foreign business. Over 40 percent of companies cited ITAR restrictions as causing hiring difficulties.[3] Many of the survey's findings show that our nation's small space businesses are the most vulnerable to fluctuations in government funding and compliance burdens. Small businesses are the foundation of any strong and innovative industry, but we are facing some real challenges in sustaining and growing that sector due to export restrictions.

At a time when the U.S. government should be encouraging growth across all sectors of the economy, export controls are limiting growth in the space sector, especially among component suppliers. In the absence of a healthy, cutting-edge, space industrial base in the U.S., our government may be forced into relying on foreign suppliers for key components, and we face the very real threat of loosing our preeminence in space.

Industrial Base Challenges: Shrinking Workforce

In addition to concerns about export controls on the overall health of the U.S. space industry, we face a significant challenge as many employees are approaching retirement eligibility. America's workers, scientists, and engineers represent the core of our nation's space industrial base – but there are very real concerns that we are not producing the workforce needed to keep America on the cutting edge of technology development.

---

[2] Testimony of Mr. Pierre Chao, before the House Foreign Affairs Committee's Subcommittee on Terrorism, Nonproliferation and Trade, April 2, 2009

[3] *Barriers to Entry and Sustainability in the U.S. Space Industry*, National Security Space Office, February, 2009

According to a 2005 study performed by the Defense Department's Cost Analysis Improvement Group (CAIG), there is a "significant shortfall in the 30-40 year-old engineers and scientists supporting the space industry."[4] The seasoned employees in 30-40 year-old range, who would normally be prepared to take the reigns when older employees retire, are just not present in sufficient numbers.

Without a robust pool of space professionals to draw from, we risk losing our nation's edge in producing the world's preeminent space technologies, especially as nations like China and India graduate thousands more engineers than U.S. universities annually. While we no longer face the "missile gap" of the early days of the space age, the "*engineer gap*" is a real and growing concern.

Adding to concerns, today almost 70 % of our eighth graders are below proficient in math and science, and our fifteen year olds are constantly being outperformed by other nations.[5] According to the GAO, in 2006 the percentage of U.S. post-secondary students earning degrees in science, technology, engineering, and mathematics (STEM) fields has fallen from 32 percent in 1995 to 27 percent in 2004.[6] Our industry is very concerned about their future workforce and is very supportive of efforts to improve STEM education.

To help attract more young people to the space industry and STEM career fields, I'm pleased the Department of Defense and other agencies are supporting industry's very own STEM program, the Team America Rocketry Challenge (TARC). TARC is the world's largest rocket competition for middle and high school students and is an event that is highly enjoyable to attend. Among this years' 100 finalists are teams from Wilson High School in Florence, South Carolina, First Baptist Church in Manchester, Connecticut, and both Mitchell High School and Cheyenne Mountain Charter Academy form Colorado Springs. We invite all of you to attend the final competition in The Plains, Virginia, on May 16.

Industrial Base Challenges: Acquisition Process

Challenges specific to our acquisition system also hamper industry's ability to provide the necessary space systems our warfighters expect. Although most defense programs deliver products and services on schedule and on budget, recent studies and reports indicate that cost growth, schedule delays and performance challenges that impact some major programs have emphasized the need to make meaningful reforms to the acquisition system. Space systems are often the target of these discussions.

---

[4] Center for Strategic & International Studies, *Health of the U.S. Space Industrial Base and the Impact of Export Controls*, February 2008

[5] Based on results from the 2007 National Assessment of Educational Progress administered by the U.S. Dept. of Education and the 2006 Programme for International Student Assessment administered by the OECD

[6] United States Government Accountability Office, Testimony before the Committee on Education and the Workforce, House of Representatives, *Science, Technology, Engineering, and Mathematics Trends and the Role of Federal Programs*

The ability of the defense acquisition process to produce the best military equipment at the best value for the taxpayers is dependent on several important factors – a strong industrial base, a rational and flexible acquisition process, well-defined requirements, budget realism, stable procurement plans, and a well-trained and experienced acquisition workforce.

AIA believes that there is room for significant improvement in the Defense Department's acquisition process. This process is complex, crossing many functional and organizational areas leaving many observers to conclude that the system is too large, too bureaucratic, too cumbersome, too expensive, and too slow in getting needed goods and services to our warfighters.

Up front planning and knowledge of industrial base capabilities are critical to success, in order to enable informed and meaningful trade-offs between (a) less ambitious capabilities that can be made available more quickly at lower cost and (b) capabilities that rely on greater leaps in technology but that are also harder to define, involve greater risk, take longer to deploy and are more costly.

Problems emerge when there is a failure in one or more of these factors. As DoD Under Secretary John Young wrote in his January 30, 2009 memo to Secretary Gates, cost growth took place in a number of programs because they were "built on artificially low cost estimates, optimistic schedules and assumptions, immature design or technology, fluid requirements and other issues." [7] He identified changing or excessive requirements as a factor in most programs and budget instability as a major problem stating: "programs have apparent cost growth because the Defense Department cut annual quantities for budget reasons, driving higher unit costs." In this memo, the Advanced Extremely High Frequency (AEHF) Satellite was highlighted as a victim of DoD's overly optimistic assumptions, and Wideband Global SATCOM registered as having cost overruns merely as a result of buying two additional satellites. These changes were made not to reflect a flaw in program performance, rather in recognition of their role in fulfilling a critically needed bandwidth capability.

There have been a number of efforts recently to address these factors through the legislative process. In the last decade, the number of acquisition provisions enacted by Congress has increased by three-to-four fold. In the past two years alone, that number has approached 100. While some of these address serious problems, the continuously changing set of acquisition rules is itself causing instability in the system which could contribute to schedule delays and increased costs.

As highlighted by the good work of the Government Accountability Office, more realistic cost estimating is critical to improving space system acquisition. In July 2006, AIA formed a Cost Estimating Forum Working Group made up of industry contractors and key government representatives from the USAF, OSD, NRO and DNI. This effort

[7] *Reasons for Cost Changes for Selected Major Defense Acquisition Programs*, John J. Young, Jr. USD (AT&L), January 30, 2009

developed into what is known today as the Joint Space Cost Council, chaired by Air Force Deputy Assistant Secretary for Cost and Economics.

On January 9, 2009 the Under Secretary of Defense for Acquisition, Technology & Logistics announced that the Defense Department is moving to require the standard work breakdown structure pioneered by the Joint Space Cost Council – an important step towards making improvements in national security space program management. The Cost Council has engaged NASA, GAO and other federal government stakeholders to continue to expand their efforts. I'm proud of this effort and the work that industry and government have done to address challenges associated with national security space cost estimating.

When it comes to acquisition reform as a whole, any long-lasting reform must consider the impact both within the government and within industry to assure successful outcomes. Successful and sustained reform must also take into consideration the factors that drive industry decision making and the impact on the capability of the space industrial base to support our national space policy.

Government and industry agree that there are major disconnects in the defense acquisition process among the government requirements, programs and budgeting functions. All these critical elements of the defense acquisition process must be repaired. Budget and program stability along with solid cost estimating are the building blocks of world-class acquisition. To achieve that goal will require a renewed partnership between the Defense Department, Congress, and industry.

Steps to Help Ensure a Healthy Space Industrial Base

Budget and requirements instability, an inefficient procurement system, and unpredictable "feast or famine" lead times between contracts have all contributed to a weakened space industry and increased numbers of space program schedule delays and cost overruns. Coupled with an aging workforce that is not being replaced by an adequate number of bright young minds, and export restrictions that limit growth, the space industry is being severely strained.

AIA released a report earlier this year, "The Role of Space in Addressing America's National Priorities," which identifies areas for immediate attention in the space sector. Many of these recommendations, if acted upon, would also contribute to the strengthening of the U.S. space industrial base.[8]

First, AIA recommends the establishment of a national space management and coordination body, reporting to the president, with the authority to coordinate cross departmental and agency space efforts. With management, budget, and acquisition authority for space programs currently spread across a variety of competing agencies, a

[8] AIA, *The Role of Space in Addressing America's National Priorities*, http://www.aia-aerospace.org/assets/report_space_0109.pdf

space coordination body would help provide the strategic and comprehensive decision-making so critical to the space industry.

Second, balanced and stable funding is critical for the development of national security space systems. Complex space platforms cannot be built overnight and are often designed and built over long periods of time. Stable budgeting helps ensure that industry is able to do the planning necessary to engage in the long-term development of space technology and AIA supports implementing multi-year procurement authorities for complex space systems to help stabilize the budgeting process. AIA agrees with the CAIG's conclusion that "stability starts with government's funding and plans, leads to efficient and productive industry workforce, and results in well performing programs that deliver mission area success."

Third, we must continue to create opportunities for our current workforce and make science and education a national priority. Support for STEM initiatives are critical and must continue to help lessen the strain of the nation's "engineer gap." Additionally, it will be important to continue to support small businesses in the industry to keep a healthy job market available and ensure innovation in the marketplace.

Finally, when it comes to ITAR and export controls, the time has come to take the concrete steps needed to re-evaluate ITAR controls on space technologies, including commercial communications satellite technologies, and sharpen the provisions of the 1998 law to keep our country safe and industry strong. Without meaningful steps to modernize the U.S. export control system and enhance space trade among our allies, the U.S. faces a real and daunting possibility of losing our preeminence in space and our ability to compete in the global space industry.

Our nation's space industry began over fifty years ago to design and build the systems and capabilities needed by our military and early space program. Today, the U.S. government relies on space technologies and its associated industry more than ever before. As such, it is important to provide the resources needed to maintain a healthy workforce and industrial base. This includes robust and stable funding, investments in STEM education, support for national space leadership, and modernization of outdated export controls on space systems. With other nations such as China and India rapidly improving their own space efforts, it is essential that our nation take the right steps to ensure our space industry – which really is a national treasure – remains the world leader.

DISCLOSURE FORM FOR WITNESSES
CONCERNING FEDERAL CONTRACT AND GRANT INFORMATION

INSTRUCTION TO WITNESSES: Rule 11, clause 2(g)(4), of the Rules of the U.S. House of Representatives for the 111th Congress requires nongovernmental witnesses appearing before House committees to include in their written statements a curriculum vitae and a disclosure of the amount and source of any federal contracts or grants (including subcontracts and subgrants) received during the current and two previous fiscal years either by the witness or by an entity represented by the witness. This form is intended to assist witnesses appearing before the House Armed Services Committee in complying with the House rule.

Witness name: Marion Blakey

Capacity in which appearing: (check one)

___Individual

✓ Representative

If appearing in a representative capacity, name of the company, association or other entity being represented: Aerospace Industries Association

FISCAL YEAR 2009

federal grant(s) / contracts	federal agency	dollar value	subject(s) of contract or grant
None			

FISCAL YEAR 2008

federal grant(s) / contracts	federal agency	dollar value	subject(s) of contract or grant
None			

FISCAL YEAR 2007

Federal grant(s) / contracts	federal agency	dollar value	subject(s) of contract or grant
None			

Federal Contract Information: If you or the entity you represent before the Committee on Armed Services has contracts (including subcontracts) with the federal government, please provide the following information:

Number of contracts (including subcontracts) with the federal government:

Current fiscal year (2009):_____; NA
Fiscal year 2008:_____;
Fiscal year 2007:_____.

Federal agencies with which federal contracts are held:

Current fiscal year (2009):_____; NA
Fiscal year 2008:_____;
Fiscal year 2007:_____.

List of subjects of federal contract(s) (for example, ship construction, aircraft parts manufacturing, software design, force structure consultant, architecture & engineering services, etc.):

Current fiscal year (2009):_____; NA
Fiscal year 2008:_____;
Fiscal year 2007:_____.

Aggregate dollar value of federal contracts held:

Current fiscal year (2009):_____; NA
Fiscal year 2008:_____;
Fiscal year 2007:_____.

Federal Grant Information: If you or the entity you represent before the Committee on Armed Services has grants (including subgrants) with the federal government, please provide the following information:

Number of grants (including subgrants) with the federal government:

Current fiscal year (2009):_____; NA
Fiscal year 2008:_____;
Fiscal year 2007:_____.

Federal agencies with which federal grants are held:

Current fiscal year (2009):_____; NA
Fiscal year 2008:_____;
Fiscal year 2007:_____.

List of subjects of federal grants(s) (for example, materials research, sociological study, software design, etc.):

Current fiscal year (2009):_____; NA
Fiscal year 2008:_____;
Fiscal year 2007:_____.

Aggregate dollar value of federal grants held:

Current fiscal year (2009):_____; NA
Fiscal year 2008:_____;
Fiscal year 2007:_____.

○